NASA SP-7500 (06)

MANAGEMENT

A CONTINUING LITERATURE SURVEY

– With Indexes –

MARCH 1972

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

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NASA SP-7500 (06)

MANAGEMENT

A CONTINUING LITERATURE SURVEY

– With Indexes –

A selection of annotated references to unclassfied reports and journal articles that were introduced into the NASA Scientific and Technical Information System during 1971.

Scientific and Technical Information Office
OFFICE OF INDUSTRY AFFAIRS
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MARCH 1972
Washington, D. C.

INTRODUCTION

COVERAGE

Management is a compilation of references to selected reports, journal articles, and other documents on the subject of management. This publication lists 450 documents originally announced in the 1971 issues of *Scientific and Technical Aerospace Reports (STAR)* or *International Aerospace Abstracts (IAA)*.

This supplement differs from earlier ones in limiting the coverage to references announced only in the two abstract journals cited above, and in the elimination of the special subject category sections used in previous supplements, in order to save time and money. For the same reasons, the entries have been reproduced exactly as they appeared originally in *STAR* and *IAA*, resulting in slight variations in the typography. The earlier issues in this series are listed on the inside of the front cover.

ORGANIZATION

Each entry in this bibliography consists of a bibliographic citation accompanied by an abstract. The listing of the entries is arranged in two sections: *IAA* entries and *STAR* entries, in that order. Each entry is preceded by the accession number which accompanied it originally in the abstract journal, and the entries in each section are arranged in ascending accession number order.

Following the abstract sections, three indexes are included: subject, personal author, and corporate source.

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IAA Entries

All documents cited in the *IAA* section are available from:

Technical Information Service
American Institute of Aeronautics and Astronautics, Inc. (AIAA)
750 Third Avenue
New York, N.Y. 10017

Paper copies are available at $5 per document up to a maximum of 20 pages. The charge for each additional page is 25 cents.

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General Availability

All publications abstracted in this literature survey are available to the public through the sources as indicated in the STAR Entries or IAA Entries. It is suggested that the literature survey user contact his own library or other local libraries prior to ordering any publication inasmuch as many of the documents have been widely distributed by the issuing agencies, especially NASA. A listing of public collections of NASA documents is included on the inside back cover.

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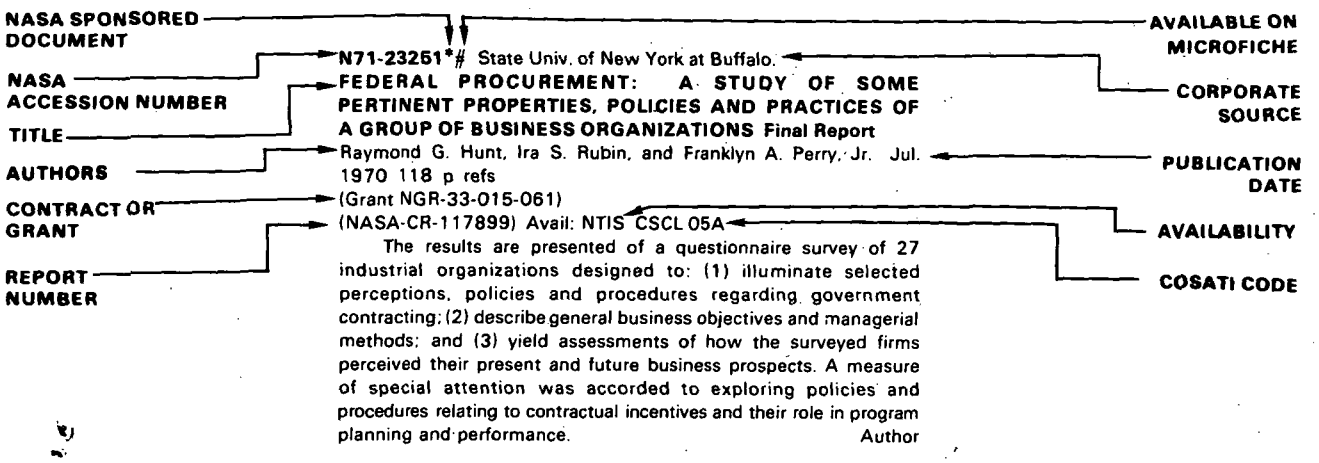
TABLE OF CONTENTS

TYPICAL CITATION AND ABSTRACT FROM STAR



N71-23261*# State Univ. of New York at Buffalo.

FEDERAL PROCUREMENT: A STUDY OF SOME PERTINENT PROPERTIES, POLICIES AND PRACTICES OF A GROUP OF BUSINESS ORGANIZATIONS Final Report

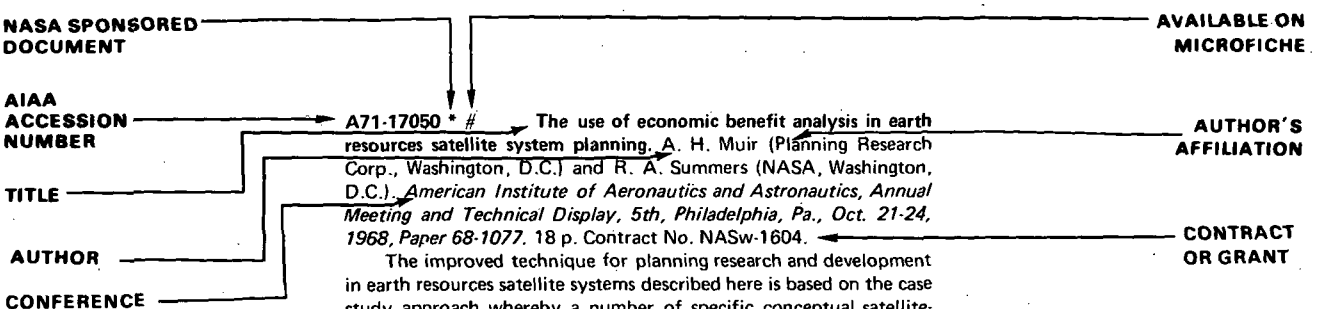
Raymond G. Hunt, Ira S. Rubin, and Franklyn A. Perry, Jr. Jul. 1970 118 p refs

(Grant NGR-33-015-061)

(NASA-CR-117899) Avail: NTIS CSCL 05A

The results are presented of a questionnaire survey of 27 industrial organizations designed to: (1) illuminate selected perceptions, policies and procedures regarding government contracting; (2) describe general business objectives and managerial methods; and (3) yield assessments of how the surveyed firms perceived their present and future business prospects. A measure of special attention was accorded to exploring policies and procedures relating to contractual incentives and their role in program planning and performance. Author

TYPICAL CITATION AND ABSTRACT FROM IAA



A71-17050 * # **The use of economic benefit analysis in earth resources satellite system planning.** A. H. Muir (Planning Research Corp., Washington, D.C.) and R. A. Summers (NASA, Washington, D.C.). *American Institute of Aeronautics and Astronautics, Annual Meeting and Technical Display, 5th, Philadelphia, Pa., Oct. 21-24, 1968, Paper 68-1077.* 18 p. Contract No. NASw-1604.

The improved technique for planning research and development in earth resources satellite systems described here is based on the case study approach whereby a number of specific conceptual satellite-assisted information systems are projected for an operational time frame. Economic impact analyses are performed for these technically feasible, user-responsive systems (e.g., in agriculture and hydrology), so that economically promising systems can be separated from nonpromising ones. Parametric data are collected from these conceptual system designs for such subsystems as sensors, data processing, attitude control and telemetry. By means of a 'sufficient' number of case studies, a probable 'technology/system scenario' for future space applications can be described. A distillation of parametric requirements from these cases provides a functional set of applied research goals or guidelines. These requirements must then be evaluated in the light of current status and trends in technology and subsystem development. (Author)

MANAGEMENT

a continuing literature survey

MARCH 1972

IAA ENTRIES

A71-10189 **Management of confidential information.** Edward V. Comber (System Dynamics, Inc., Oakland, Calif.). In: American Federation of Information Processing Societies, Fall Joint Computer Conference, Las Vegas, Nev., November 18-20, 1969, Proceedings. Montvale, N.J., AFIPS Press (AFIPS Conference Proceedings. Volume 35), 1969, p. 135-143. 6 refs.

Brief discussion of significant elements that have been identified with the question of privacy. Key factors that could serve as a foundation for a basic privacy control system are brought together. It is pointed out that the critical element in this question of privacy should not address itself to the electromechanical capability of the computer or system telecommunications functions. The true focal point is the direct challenge to the discipline and conduct of man who is the designer and user of the data system. M.M.

A71-10279 **Economic considerations relevant to the development of new materials.** P. M. S. Jones (A/M Sir Edward Chilton, Didcot, Berks., England). *Journal of Materials Science*, vol. 5, Sept. 1970, p. 796-804. 61 refs.

The implications of some aspects of current developments in the quantitative evaluation of R & D are explored with particular reference to applied materials research. The return on materials R & D can only be determined by reference to the specific uses for which the research is intended and the apparent worthwhileness of a given programme will depend entirely on the precise role of the evaluating group in the subsequent exploitation of the research and their attitudes to risk. A subjective examination of a wide range of new materials developments suggests that lower material costs are rarely a significant factor in exploitation. The main incentives lie in reduced processing and assembly costs and miscellaneous benefits to the ultimate user. The treatment of uncertainty and risk and setting value to multiple research approaches are discussed. (Author)

A71-10883 **Use of an error model and a simulation program to support technical management.** L. O. Brown and R. F. Baum (TRW Systems Group, Redondo Beach, Calif.). In: International Foundation for Telemetering, International Telemetering Conference, Los Angeles, Calif., October 13-15, 1970, Proceedings. Conference co-sponsored by the Instrument Society of America and Electronic Industries Association. Woodland Hills, Calif., International Foundation for Telemetering (ITC Proceedings. Volume 6), 1970, p. 78-84.

This paper contains a discussion of various computer programs and their interconnection with an 'error model' which have been developed and are being used by TRW, to form a very useful tool for technical management of a missile development and testing program. General aspects and requirements of the simulation and of some subroutines are outlined. A review of possible error sources is made emphasizing their effect on the frequency tracking performance of a typical instrumentation system such as the FPQ-6 radar operating with a radar transponder installed on the target. (Author)

A71-11190 **Evaluating technical work in cost-plus contracts.** A. Michael Agapos (Louisiana State University, New Orleans, La.). *Management Services*, vol. 7, Nov.-Dec. 1970, p. 24-30.

Discussion of a system for evaluating technical work in cost-plus contracts which can be used effectively to alleviate many of the initial problems encountered in technical programs. This system eliminates time lags in project management data and serves to identify trouble areas in both the technical and financial divisions of technical projects. The approach can be used in conjunction with other management systems for greater control by an agency of the government or by a government contractor who wishes to establish his position in terms of schedules and fee payments on cost-plus contracts. G.R.

A71-11852 # **Forecasting important trends in the development of science and technology (Prognozirovanie vazhneishikh napravlenii razvitiia nauki i tekhniki).** G. M. Dobrov (Akademiia Nauk Ukrainskoi SSR, Otdelenie Kompleksnykh Problem Naukovedeniia, Kiev, Ukrainian SSR). In: Science studies, prediction, and information procurement; All-Union Symposium, 2nd, Kiev, Ukrainian SSR, December 6-9, 1967, Proceedings (Naukovedenie, prognozirovanie, informatika; Vsesoiuznyi Simpozium, 2nd, Kiev, Ukrainian SSR, December 6-9, 1967, Materialy). Edited by G. M. Dobrov. Kiev, Izdatel'stvo Naukova Dumka, 1970, p. 5-26. 32 refs. In Russian.

Description of different methods for forecasting the development of science and technology in order to provide a basis for planning and to gain insight on the future impact of the new developments. Three general categories of forecasting are defined according to the tasks involved. These consist of (1) the prediction of most probable trends and possible alternatives on the basis of known tendencies and regularities in the development process, (2) formulation of a development program for these trends on the basis of social requirements and resources, and (3) evaluation of organizational structures needed in the development. Various extrapolation, simulation, and specialized evaluation procedures used in these forecasting tasks are delineated, and factors affecting the temporal range of prediction are discussed. Criteria for selecting the most probable directions of development are formulated, and an organizational format is presented for planning the forecasting process. T.M.

A71-11855 # **Principles of improving the organizational structures of scientific research establishments (O printsipakh sovershenstvovaniia organizatsionnykh struktur nauchno-issledovatel'skikh uchrezhdenii).** G. A. Lakhtin and V. V. Kuleshov (Akademiia Nauk SSSR, Institut Ekonomiki, Novosibirsk, USSR). In: Science studies, prediction, and information procurement; All-Union Symposium, 2nd, Kiev, Ukrainian SSR, December 6-9, 1967, Proceedings (Naukovedenie, prognozirovanie, informatika; Vsesoiuznyi Simpozium, 2nd, Kiev, Ukrainian SSR, December 6-9, 1967, Materialy). Edited by G. M. Dobrov. Kiev, Izdatel'stvo Naukova Dumka, 1970, p. 136-152. 8 refs. In Russian.

Investigation of qualitative and quantitative approaches to the selection of rational structures for scientific research organizations from a systems analysis viewpoint. A general description of organizational structures is given in terms of (1) goals and purposes of the organization, (2) structural elements and their interactions, and (3) planning, control, coordination, and organization functions of management. Improvement of the organization is discussed from the viewpoint of studies aimed at (1) defining the correspondence with established goals, (2) discovery of intrastructural disproportions among different elements, (3) study of the capabilities of management in assuming the required control solutions, and (4) analysis of the degrees of centralization and decentralization in adopting solutions. Functional and thematic arrangements of structures are examined, and attention is given to quantitative methods of ensuring correspondence between goals and resources. T.M.

A71-11856 # **Social factors in controlling the development of scientific teams (Sotsial'nye faktory upravleniia razvitiem nauchnykh kollektivov).** Iu. V. Poshekhonov (Akademiia Obshchestvennykh Nauk, Moscow, USSR). In: Science studies, prediction, and information procurement; All-Union Symposium, 2nd, Kiev, Ukrainian SSR, December 6-9, 1967, Proceedings (Naukovedenie, prognozirovanie, informatika; Vsesoiuznyi Simpozium, 2nd, Kiev, Ukrainian SSR, December 6-9, 1967, Materialy). Edited by G. M. Dobrov. Kiev, Izdatel'stvo Naukova Dumka, 1970, p. 166-175. 5 refs. In Russian.

Experimental sociological investigation of labor organization and control structure in scientific research institutes concerned with the solution of current and expected practical problems for different branches of industry. These scientific teams are concerned with tasks that are intermediate between theoretical research at universities and production and manufacturing in plants. A survey covering a total of 640 persons was made in five institutes working for different branches of industry. The correspondents consisted of 148 management personnel, 156 senior scientists, 97 junior scientists, 169 engineers, and 70 designers. The goal of the survey was to study the social aspects of labor organization and management. The results are discussed in terms of the correspondence between the assigned tasks and the percentage of allotted time actually spent by various personnel in performing these tasks. T.M.

A71-11858 # **Forecasting technological development on the basis of a quantitative analysis of the engineering and technical significance of inventions (Prognozirovanie razvitiia tekhniki na osnove kolichestvennogo analiza inzhenerno-tekhnicheskoi znachimosti izobretenii).** V. G. Gmoshinskii (Tsentral'nyi Nauchno-Issledovatel'skii Institut Patentnoi Informatsii, USSR). In: Science studies, prediction, and information procurement; All-Union Symposium, 2nd, Kiev, Ukrainian SSR, December 6-9, 1967, Proceedings (Naukovedenie, prognozirovanie, informatika; Vsesoiuznyi Simpozium, 2nd. Kiev, Ukrainian SSR, December 6-9, 1967, Materialy). Edited by G. M. Dobrov. Kiev, Izdatel'stvo Naukova Dumka, 1970, p. 218-232. In Russian.

Development of a quantitative method of evaluating the engineering and technical significance of new patents, and application of the resulting algorithms to the prediction of future technological advances in the area of earth moving equipment. The forecasting problem is posed and solved with the aid of variational statistics, mathematical analysis, and matrix calculus. Both long-term and short-term forecasting is considered, and an attempt is made to clarify certain aspects related to the evaluation of the effectiveness of new inventions from an economics viewpoint. The proposed method is illustrated by examples of pile driving machines and deep foundation laying equipment. T.M.

A71-11859 # **Mathematical estimation and forecasting of the optimal sample size when studying the working time losses of personnel in scientific research organizations (Matematicheskaia otsenka i prognozirovanie optimal'noi velichiny vyborki pri izuchenii zatrat rabochego vremeni sotrudnikov nauchno-issledovatel'skikh organizatsii).** P. N. Zavlin (Gosudarstvennoe Spetsial'noe Konstruktovskoe Biuro). In: Science studies, prediction, and information procurement; All-Union Symposium, 2nd, Kiev, Ukrainian SSR, December 6-9, 1967, Proceedings (Naukovedenie, prognozirovanie, informatika; Vsesoiuznyi Simpozium, 2nd, Kiev, Ukrainian SSR, December 6-9, 1967, Materialy). Edited by G. M. Dobrov. Kiev, Izdatel'stvo Naukova Dumka, 1970, p. 268-277. 6 refs. In Russian.

Development of a mathematical model for optimizing observational data sampling during discrete studies of the working-time budget utilization by personnel in scientific research organizations. The studies involve time losses imposed by the observations themselves, and their significance is taken into account. Procedures are described for determining the accuracy with which the selected samples represent the total system, and criteria are established for the necessary numbers of sample subjects in groups of personnel performing different functions. T.M.

A71-11860 # **Task of the long-term planning of scientific and technical progress by machine design enterprises (Opyt perspektivnogo planirovaniia nauchno-tekhnicheskogo progressa na mashinostroitel'nykh predpriiatiiakh).** A. B. L'vovich (Kazanskii Aviatsionnyi Institut, Kazan, USSR). In: Science studies, prediction, and information procurement; All-Union Symposium, 2nd, Kiev, Ukrainian SSR, December 6-9, 1967, Proceedings (Naukovedenie, prognozirovanie, informatika; Vsesoiuznyi Simpozium, 2nd, Kiev, Ukrainian SSR, December 6-9, 1967, Materialy). Edited by G. M. Dobrov. Kiev, Izdatel'stvo Naukova Dumka, 1970, p. 305-313. In Russian.

Description of the organizing, staging, and sequencing tasks involved in the long-term planning of scientific and technological development of machine design and construction enterprises. The coordination and development of long-term plans is discussed on both national industrial levels and various structural levels within a particular enterprise. The establishment of coordinating commissions and information gathering networks is explained, and technological criteria for judging the degree of development are defined. These criteria are based on general goals of (1) quality and reliability improvement, (2) application of new industrial processes as they become available, (3) procurement of new equipment, (4) enhancement of specialization, and (5) improvement of control and management. T.M.

A71-12121 **Technology assessment. II - Its effects on science and engineering.** Morris Tanenbaum (Western Electric Co., Inc., New York, N.Y.). *Research Management*, vol. 13, Nov. 1970, p. 427-434.

Exploration of the general effects that a growing activity in technology assessments may have on the development of science and engineering. It is felt that the overriding objective of technology

assessments must be the creation of additional parameters to guide and stimulate technological development in paths responsive to social needs without impeding the rate of technology development. How the traditions of the engineering and management professions may have to change to respond to these responsibilities and opportunities is the main object of this study. It is shown that only to the degree to which the assessments define desirable directions and clearly circumscribe undesirable ones, and thereby reduce the risk of public acceptance of new technology, can these assessments stimulate worthwhile technological progress. If, however, they serve only to generate concern and to increase uncertainty, they will increase the risk associated with technological change. M.V.E.

A71-12122 Network analysis for multiple project planning. R. Billiau, P. Dejonghe (Studiecentrum voor Kernenergie, Mol, Belgium), A. Nys, and E. Roba (Société Belge d'Economie et Mathématique Appliquées, Brussels, Belgium). *Research Management,* vol. 13, Nov. 1970, p. 461-469.

Discussion of the use of network analysis techniques in multiple project planning. Reviewed work phases include project analysis and data collection, planning data processing, plan revisions, budget planning. The experience gained in the process of applying network planning techniques indicates that, with the aid of a computer, these techniques provide a comprehensive understanding of the total program and facilitate problems of project readjustments and budgeting. M.V.E.

A71-12427 Management of the Skynet project. P. G. Whicher (Ministry of Technology, London, England). In: Skynet; Institution of Electrical Engineers, Meeting, London, England, April 20, 1970, Proceedings. London, Institution of Electrical Engineers (IEE Conference Publication No. 63), 1970, p. 5-11.

Description of the Skynet project management functions in the areas of professional engineering and contract handling. The project involved cooperation between the UK and the U.S., and the resulting problems of coordination are considered. The definition of the precise scope of the system was the initial task, and the way this was handled is described. The allocation of management responsibilities is outlined for the space, ground, support, and control segments. The planning, coordination, and cooperation that went into the placing of numerous interrelated contracts are delineated, and the use of PERT critical path analysis in management planning is discussed. The present status of the Skynet project is briefly reviewed. T.M.

A71-12746 Concorde and the air travel market. E. H. Burgess (British Aircraft Corp., Ltd., Filton, Bristol, England). *Esso Air World,* vol. 23, no. 2, 1970, p. 49-51.

Discussion of the economical and operational prospects of the Concorde. Studies and experience indicate that the high speed of travel on Concordes would appeal to passengers notwithstanding a 35% increase in fares. It is expected that a profitable operation of the Concorde will prove realizable. It is maintained that a mixed fleet of Concordes and subsonic airliners, tailored to the operator's route and traffic characteristics, will achieve a higher return on capital investment than an all-subsonic fleet of equivalent capacity. V.Z.

A71-13743 Management of design. B. T. Turner (Industrial and Commercial Techniques, Ltd., England). *(Royal Aeronautical Society, Symposium on Space Satellite and Launch Vehicle Technology, London, England, Oct. 8, 1969.) Aeronautical Journal,* vol. 74, Nov. 1970, p. 935, 936.

Discussion of design management, which is concerned with the exercise of mental, verbal, and graphical skills which are so directed and controlled as to meet a social need or needs. Any manager's job consists of deciding what has to be done, and assuring that the appropriate actions are taken to achieve the decisions taken. The criteria for management control systems are outlined, and the importance of design methods is stressed. F.R.L

A71-14097 # Placing the management of defense and space programs in perspective. David D. Acker (North American Rockwell Corp., Autonetics Div., Anaheim, Calif.). *American Society of Mechanical Engineers, Winter Annual Meeting, New York, N.Y., Nov. 29-Dec. 3, 1970, Paper 70-WA/Mgt-5.* 4 p. Members, $1.00; nonmembers, $2.00.

The author assesses the management of defense and space programs. He describes the contractual environment leading to development of the present-day management systems and gives attention to (a) management system criteria, (b) the nature of program management, (c) organizational structures for managing programs, and (d) problems and benefits attributable to management approaches used. (Author)

A71-14926 # Active role for NASC seen in 70s by agency's executive secretary. William A. Anders (National Aeronautics and Space Council, Washington, D.C.). *Aerospace Management,* vol. 5, no. 1, 1970, p. 9-14.

Discussion of the implementation of the prerogatives provided by the 1958 Space Act to the National Aeronautic and Space Council, as envisaged in the 70s by a former astronaut, now executive secretary of the Council. The useful activity of the Space Task Group since its formation in 1969 as a body advising the President on a balanced space program is mentioned. Staffing of the top team and policies needed in aeronautics are also considered as immediate problems facing the Council. It is maintained that as a policy developing team of the Executive Branch, the Council has a unique vantage point for the consideration of extraordinary space problems and recommendation of viable and realistic alternatives to the President for their solution. V.Z.

A71-14937 * # NASA's multiple interagency interfaces blend know-how toward complex programs. Jacob E. Smart (NASA, Washington, D.C.). *Aerospace Management,* vol. 5, no. 1, 1970, p. 111-118.

Survey of the versatile NASA activities in integrating work and resources for the execution of various complex aerospace programs involving numerous challenges. The functions of various NASA agencies are described briefly. A diagram of NASA's functional structure is given. V.Z.

A71-14939 * # Patents and licensing policy. Gayle Parker (NASA, Office of General Counsel, Washington, D.C.). *Aerospace Management,* vol. 5, no. 1, 1970, p. 126-130.

Discussion of patents and licensing policies adopted by NASA and its affiliates. Essential in these policies is a study of inventions for technical significance and patentability at NASA field centers, the acquisition of selected patents by NASA, and the NASA right to waive the rights of a contractor in an invention made by the contractor when the waiver is considered to be in the public interest. V.Z.

A71-14992 # The development concept of pooling of technical resources among airlines - Some practical aspects of technical

cooperation. K. Lindenmann (Swissair AG, Kloten, Switzerland). In: Civil Aviation Safety Centre, Annual Technical Conference, 5th, Beirut, Lebanon, September 29-October 2, 1970, Final Report. Beirut, Civil Aviation Safety Centre, 1970. 16 p.; Discussion. 3 p.

Discussion of problems involved in the pooling of technical resources among different airlines for cutting the investment and maintenance cost of aircraft fleets. As an example, the cooperation between KLM, SAS, SWR, and UTA (KSSU) is discussed. Some most important requirements which must be met for achieving successful technical cooperation are discussed. A hierarchic set of joint working bodies, organized for the implementation of technical cooperation, is described. Some specific problems in technical cooperation are examined, including: (1) expense of management time, (2) technical standards and inspection, (3) common aircraft specifications, manuals, maintenance requirements, and component specifications, and (4) technical information service. Z.W.

A71-14993 # **The management and economics of airport operation - Main factors which influence cost efficiency.** Keith M. McLeod (British Airports Authority, London, England). In: Civil Aviation Safety Centre, Annual Technical Conference, 5th, Beirut, Lebanon, September 29-October 2, 1970, Final Report. Beirut, Civil Aviation Safety Centre, 1970. 7 p.; Discussion. 7 p.

Analysis of a number of common factors affecting the cost efficiency of airports located in different parts of world. Emphasis is placed on the importance of recognizing the need to meet airline requirements for new facilities, including, if necessary, the will to raise airport charges in order to find the money for this purpose. Both operational and cost reasons are given for avoiding marble palaces and matching new facilities to the true needs of the business. Stress is placed on the encouragement of management to manage efficiently by giving them full authority, within defined policies, to pursue the maintenance of satisfactory standards at minimum cost. Z.W.

A71-14994 # **Airport development and operation in the 70s - A consideration of the changing requirements and their impact on developing countries.** Ian Varney (Board of Trade, London, England). In: Civil Aviation Safety Centre, Annual Technical Conference, 5th, Beirut, Lebanon, September 29-October 2, 1970, Final Report, Beirut, Civil Aviation Safety Centre, 1970. 6 p.; Discussion. 2 p.

Discussion of some factors which are of particular importance for airport development and operation in the developing countries for the next decade. It is forecast that in the ten years from 1970 to 1980 world scheduled passenger traffic will multiply three times above existing levels. Increasing growth rate of cargo must also be considered. To meet the need for the future, a master plan for airport development is postulated which would anticipate the demands which will be put upon it. Two major considerations arise from this plan: (1) arrangements for financing the development, and (2) the need for a suitable training program to ensure that all facilities are sufficiently operated and effectively managed. A detailed discussion of these requirements is included. Z.W.

A71-15291 **Space age management - Contractor program management - Forecast for 1975.** Clyde Cocke (Avco Corp., Government Products Group, San Bernardino, Calif.). In: Space sciences - Future applications for mankind; Vandenberg Scientific and Technical Societies Council, Western Space Congress, 1st, Santa Maria, Calif., October 27-29, 1970, Proceedings. Part 1. North Hollywood, Calif., Western Periodicals Co., 1970, p. 222-249. 28 refs.

Contractor Program Management techniques required in the 1970 military industrial partnership are described. A modus operandi of a typical contractor is projected through 1975 in terms of the program management functions of system engineering, configuration management, and financial management. The Minuteman Missile Program is utilized as an example to describe the Department of Defense Air Force Systems Command life cycle and the corresponding contractor business cycle. (Author)

A71-15293 **Aerospace systems project management using the critical path method (CPM) for planning and control.** Gerald E. Kobelski (USAF, Space and Missile Test Center, Vandenberg AFB, Calif.). In: Space sciences - Future applications for mankind; Vandenberg Scientific and Technical Societies Council, Western Space Congress, 1st, Santa Maria, Calif., October 27-29, 1970, Proceedings. Part 1. North Hollywood, Calif., Western Periodicals Co., 1970, p. 271-278. 8 refs.

The critical path method is a graphic networking technique used for planning and control of large projects. It goes beyond Gantt and milestone charts by offering a means for portraying the interrelationships between a project's key events and activities. It is not as sophisticated as PERT and because of this it provides a more definite and simpler model of a project. The application of CPM to a major systems project has proven extemely helpful in achieving project objectives by improving communications, increasing the perspective, and aiding in the establishment of definite goals. (Author)

A71-15348 **International policy aspects of space applications programs in the 1970's - The case of earth resource surveys.** John Hanessian, Jr. and John M. Logsdon (George Washington University, Washington, D.C.). In: Space sciences - Future applications for mankind; Vandenberg Scientific and Technical Societies Council, Western Space Congress, 1st, Santa Maria, Calif., October 27-29, 1970, Proceedings. Part 2. North Hollywood, Calif., Western Periodicals Co., 1970, p. 1046-1052.

Discussion of international political, legal, economic, and management considerations as they relate to the earth resource survey (ERS) satellite program. A description of this program as currently planned by the United States is first presented. Some of the more pertinent policy questions related to space applications programs which must be decided during the 1970's are sketched and discussed. They include the question of 'intrusion' into territorial sovereignty; ownership of data secured from earth orbit and control over its dissemination; possible use of these data for economic or military exploitive purposes; determination of and successful use of appropriate mechanisms for the participation of developing countries in ERS programs; and reaching international agreement on the selection of the appropriate international management for an operational ERS program. O.H.

A71-15349 **Technical system management - European space experience implemented in related fields.** Joachim Schatz (Rheinmetall GmbH, Düsseldorf, West Germany). In: Space sciences - Future applications for mankind; Vandenberg Scientific and Technical Societies Council, Western Space Congress, 1st, Santa Maria, Calif., October 27-29, 1970, Proceedings. Part 2. North Hollywood, Calif., Western Periodicals Co., 1970, p. 1053-1062.

The paper begins with a survey of the USA-Europe cooperative space programs, followed by a reference to the experience gained in project management with the ESRO-I satellite, and to the various links between project management and specialist groups in space, defense and marine technology in Germany. The example of the Rheinmetall project management model (RPM), at present being

successfully applied in defense technology including the organisational links in a project management team, indicates the potentialities of effective transfer to defense technology of the project management experience gained in space technology. (Author)

A71-16285 # **Shaping the future.** Otto J. Glasser (USAF, Washington, D.C.). *Air University Review,* vol. 22, Nov.-Dec. 1970, p. 2-5, 8-10.

Discussion of the requirements, development, and acquisition activities in Headquarters USAF in the field of new weapon and support systems. The problem of funding for military research and development and the resulting constraints are discussed. The approach to the research and development programs managed by the office of the Deputy Chief of Staff, Research and Development, is explained in detail. Finally, new economical practices introduced at Headquarters USAF as a result of the various constraints on the systems acquisition are described. O.H.

A71-16742 **Startup management.** Nicholas Baloff (Stanford University, Stanford, Calif.). *IEEE Transactions on Engineering Management,* vol. EM-17, Nov. 1970, p. 132-141. 16 refs.

The causes and consequences of disrupted startups of new product and production processes are examined in relation to examples drawn from several diverse industries. It is demonstrated that inappropriate management actions can often precipitate significant deviations from expected patterns of productivity increases during startups, resulting in important short- and long-run productivity losses. Based upon the discussion, several guidelines for effective startup management are suggested. (Author)

A71-16743 **Optimal reallocation of R and D money under budget decrement.** T. S. Chidambaram. *(Institute of Management Sciences, International Meeting, 15th, Cleveland, Ohio, Sept. 13, 1968.) IEEE Transactions on Engineering Management,* vol. EM-17, Nov. 1970, p. 142-145. 5 refs. Army-supported research.

Examination of the problem, which sometimes arises in research and development management, of the necessity of revising the allotment of money because of a decrement in the total budget appropriated for research. What is usually required in such circumstances is a quick computational procedure based on a minimum of input data. New constraints expressing minimum funding to be given to each project so as to maintain stability in personnel or to satisfy prior commitments must also be taken into consideration. A simple algorithm is developed on the assumption that the current allocation is optimal at the budget level. Using the Kuhn-Tucker theory in nonlinear programming, it is shown that this algorithm reaches the revised optimal solution in a finite number of iterations. F.R.L.

A71-16744 **A structure for management decision making.** B. J. Greenblott (IBM Corp., Systems Development Div., Poughkeepsie, N.Y.) and J. C. Hung (Tennessee, University, Knoxville, Tenn.). *IEEE Transactions on Engineering Management,* vol. EM-17, Nov. 1970, p. 145-158. 10 refs.

An examination by the authors of the complexity of business decision making led to the conclusion that an organized information gathering and analysis mechanism is necessary to cope with this complexity. In this paper a proposed structure of the decision-making process is presented in the context of an R and D organization engaged in many different technical programs and projects. The foundation of this structure is an effective management team. On this foundation rest the main supports of the structure, which include a model representing the R and D process, a technological forecasting scheme to provide an indication of future direction, the project proposing and planning activities to provide the technical information needed for decision making, a set of quantitized judgments to which analytic tools can be applied, an algorithm for optimum resource allocation, and finally, a hybrid decision-making technique. An experiment has been performed with this method and the result, though not reported here, was very encouraging. (Author)

A71-17050 * # **The use of economic benefit analysis in earth resources satellite system planning.** A. H. Muir (Planning Research Corp., Washington, D.C.) and R. A. Summers (NASA, Washington, D.C.). *American Institute of Aeronautics and Astronautics, Annual Meeting and Technical Display, 5th, Philadelphia, Pa., Oct. 21-24, 1968, Paper 68-1077.* 18 p. Contract No. NASw-1604.

The improved technique for planning research and development in earth resources satellite systems described here is based on the case study approach whereby a number of specific conceptual satellite-assisted information systems are projected for an operational time frame. Economic impact analyses are performed for these technically feasible, user-responsive systems (e.g., in agriculture and hydrology), so that economically promising systems can be separated from nonpromising ones. Parametric data are collected from these conceptual system designs for such subsystems as sensors, data processing, attitude control and telemetry. By means of a 'sufficient' number of case studies, a probable 'technology/system scenario' for future space applications can be described. A distillation of parametric requirements from these cases provides a functional set of applied research goals or guidelines. These requirements must then be evaluated in the light of current status and trends in technology and subsystem development. (Author)

A71-17148 **Management and marketing in large enterprises.** Peter W. Brooks (British Aircraft Corp., Ltd., London, England). *(British-Romanian Colloquium, Oxford, England, June 26-29, 1970.) Aeronautical Journal,* vol. 74, Dec. 1970, p. 937-947.

Discussion of several typical management and marketing aspects of the operations and organization of a large British engineering company whose biggest market is abroad. Corporate strategy and questions of organization are considered giving attention to marketing strategy. The importance of having professionally-trained managers in the key positions in industry is emphasized. Management by objectives, project management, production control, marketing organization, and market analysis are discussed. G.R.

A71-17646 **NASA's bilateral and multilateral agreements - A comprehensive program for international cooperation in space research.** George S. Robinson. *Journal of Air Law and Commerce,* vol. 36, Autumn 1970, p. 729-744.

Discussion of NASA's cooperation in space research with other nations taking into consideration the history of NASA's international program and aspects of future cooperation. Political objectives of NASA's international program are examined, and a summary of cooperative space activities is presented. NASA's guidelines for international cooperation are considered. Regulations and procedures concerning the initiation of a proposal and the formal agreement regarding a cooperative aeronautics or space research project are discussed. Choices open to NASA in pursuing its program of international cooperation are investigated. G.R.

A71-17746 # **Sub-stores in a complex supply system.** Hermann Hennicke. *Dornier-Post* (English Edition), no. 4, 1970, p. 32-35.

Description of a procedure used in handling large quantities of data in a complex supply problem, together with the cost savings that can be achieved through optimum planning of storage points and transport. The procedure uses MPS (Mathematical Programming System) which includes linear separable programming, and requires the supply system to be represented in the form of a mathematical model. The result can be represented diagrammatically in a single curve. M.M.

A71-18011 **Relationship of organizational size to complexity and coordination.** S. R. Klatzky (Wisconsin, University, Madison, Wis.). *Administrative Science Quarterly,* vol. 15, Dec. 1970, p. 428-438. 15 refs. NSF Grant No. GS-1528.

Discussion of two models for explaining the relationship between the size of organizations and the percentage of staff personnel. In the first model, an interaction model, the effect of size is partially dependent on the level of functional differentiation or complexity in an organization. This interaction model has the advantage of theoretical relevance, but is not simple to construct nor to interpret. In the second model, a simpler logarithmic model, size decreases the staff component at a decreasing rate, explaining slightly more variance than the interaction model. It is simple and economical but has no theoretical basis, therefore it does not explain the social processes involved. In the absence of a theory that treats the rate of change in the staff component as a decreasing function of size, the interaction model is considered preferable. G.R.

A71-18825 * **Radar sensing in agriculture - A socio-economic viewpoint.** Stanley A. Morain, Julian Holtzman, and Floyd Henderson (Kansas, University, Lawrence, Kan.). In: EASCON '70; Institute of Electrical and Electronics Engineers, Electronics and Aerospace Systems Convention, Washington, D.C., October 26-28, 1970, Record. New York, Institute of Electrical and Electronics Engineers, Inc., 1970, p. 280-287. 25 refs. Contract No. NAS 9-10261.

Brief review of radar signal-terrain interactions, with an introduction to Great Plains agriculture and a discussion of the meaning of both seasonal and year-to-year changes in image appearance between and within crops in terms of socioeconomic benefits. As a means for obtaining crop statistics usable at several levels, a strategy for using dichotomous keys to identify crops by radar is presented. An ability to monitor within crop seasonal variations in image attributes is considered to be highly significant. F.R.L.

A71-19077 # **Navy testing in the next decade.** John G. Wissler (U.S. Naval Air Test Center). *(Society of Experimental Test Pilots, Symposium, 14th, Beverly Hills, Calif., Sept. 24-26, 1970.) Society of Experimental Test Pilots, Technical Review,* vol. 10, no. 2, 1970, p. 1-7.

A realistic appraisal of the trends in Naval Aviation testing during the 70s has to consider the dynamically changing environment that has affected naval testing during the past two decades. The 50s were characterized by a relatively leisurely pace of prototype testing ossible by the world political scene, U.S. nuclear supremacy inventory cushion of World War II and Korean War the 60s were characterized by quick reaction ams, concurrent production and a disappointing e weapons systems failures. Navy testing in the he divergent requirements of accurate visibility lopment to guide major funding commitments, t long lead time Fleet outfitting schedules brought on by a sharply declining inventory of aircraft. This dichotomy of naval aviation testing requirements will be the dominant factor in modifying the nature of the technical procedures, the time frames, and the contractual arrangements of the next decade. These changes will carry the seeds of serious management problems if they are not properly understood and addressed. (Author)

A71-19418 **The aims and methods of operational research on weapons.** A. Stratton (Defence Operational Analysis Establishment, England). *Aeronautical Journal,* vol. 75, Jan. 1971, p. 31-35; Discussion, p. 36.

The wider context of analysis which has become necessary to aid decisions in weapon procurement and deployment is discussed taking into consideration comparisons of overall military effectiveness of weapons of diverse characteristics. Aspects of modeling are discussed, and levels of operational analysis are examined. Criteria of weapon assessment are considered taking into account also an analysis of local conflict conditions. The significance of a force interaction analysis, the relationship between levels of analysis, conflict analysis, cost estimates, and the interaction of weapons with the operational environment are discussed. G.R.

A71-19449 **How to establish and operate multinational labs.** Maurice Papo (IBM World Trade Corp., New York, N.Y.). *Research Management,* vol. 14, Jan. 1971, p. 12-19.

Various aspects of operating a multinational corporation are discussed giving particular attention to the experience of IBM. Five criteria for defining an international corporation are presented. It is pointed out that in a highly compatible and integrated business three levels of operation have to be considered: national, continental, and international. Reasons for R and D laboratories abroad are examined, and the importance of an equal status of foreign laboratories is pointed out. Special problems of multinational operation including language barriers and dealing with cultural differences are investigated, and problems of coordination are discussed. G.R.

A71-19450 **Effective information and technology transfer in multinational R and D.** B. V. Potter (Esso Research and Engineering Co., Linden, N.J.). *Research Management,* vol. 14, Jan. 1971, p. 20-27.

Discussion of the problem of effective communication of constructive technical information among the various branches of a multinational company. The mechanism of information transfer is examined, and the advantages of using a common language throughout the system are shown. Two basic approaches for a common technical language are considered. It is pointed out that the driving force for information transfer across national interfaces is the incentive to put technology to work and to generate profitable growth of the business. Particular attention is given to attitudes which can be important obstacles in multinational communications. These are connected with national identity demands and with sound technical reasons for setting different targets in different countries. Examples of nonrational attitudes which impede communication among individuals within the same country as well as between persons in different nations are given. G.R.

A71-19501 * # **The utilization of engineers in industry.** Fred Landis (New York University, Bronx, N.Y.). *American Society of Mechanical Engineers, Winter Annual Meeting, New York, N.Y., Nov. 29-Dec. 3, 1970, Paper 70-WA/Mgt-12.* 10 p. Members, $1.00; nonmembers, $2.00. Grant No. NGR-33-016-067.

Based on an extensive questionnaire survey and management interviews it is shown that the time and intellectual utilization of

most engineers in industry are generally high, although there is a significant minority which remains underchallenged. Except for excessive clerical work, few of the nonengineering related tasks can or should be transferred to nonprofessional personnel. Variations in engineering utilization are defined primarily by local company attitudes and are independent of industry groups. Means of improving utilization are largely related to a better appreciation by management of the motivation factors applicable to its professional engineering staff. (Author)

A71-19558 **Quality management for the 1970's.** I. Gilroy and M. F. Tomsett (Elliott Flight Automation, Ltd., Rochester, Kent, England). In: Reliability in electronics; Institution of Electrical Engineers, Conference, London, England, December 10-12, 1969, Proceedings. London, Institution of Electrical Engineers (IEE Conference Publication No. 60), 1969, p. 90-97.

Discussion of an integrated quality approach under one management to achieve formalized costed reliability, maintainability, and quality programs. Factors affecting quality programs are evaluated, and aspects of a total quality program are considered. Quality planning receives attention. A reliability program plan, a maintainability program plan, and the production quality program plan are described. F.R.L.

A71-19714 # **A project information and simulation system for aerospace management.** A. C. Singhal, J. J. Rosati, and G. Doeh (TRW Systems Group, Redondo Beach, Calif.). *American Institute of Aeronautics and Astronautics, Integrated Information Systems Conference, Palo Alto, Calif., Feb. 17-19, 1971, Paper 71-238.* 9 p. Members, $1.50; nonmembers, $2.00.

An integrated system, requiring a dynamic data base, provides management decision data related to the overall effect of typical problems in aerospace vehicle development programs. Simulation models allowing management to determine the impact of engineering changes and delays on program and subprogram costs and schedules, with a technique for project status evaluation, are presented. Analytical simulation models permit design optimization, evaluation of competitive proposals, vehicle and system performance verification, configuration tradeoff studies, and identification of potential problems. Advantages of the system to project management are discussed and several examples of simulation model usage for a hypothetical helicopter program are given. (Author)

A71-19715 # **Saturn information reporting system - An integrated task management system.** Robert E. Brantingham and Edward H. Chandler, Jr. (IBM Corp., Federal Systems Div., Cape Canaveral, Fla.). *American Institute of Aeronautics and Astronautics, Integrated Information Systems Conference, Palo Alto, Calif., Feb. 17-19, 1971, Paper 71-239.* 6 p. Members, $1.50; nonmembers, $2.00.

The information management system described is used to schedule, control and status IBM's work as the Instrument Unit stage contractor on the Apollo/Saturn Program at NASA's Kennedy Space Center. All pertinent data is included in a central data base which is maintained through the use of a closed loop task control system. From this integrated data base, daily reports are extracted in the format and detail required by all organization elements to manage their work. This information management system has proven to be a valuable tool for controlling all tasks in the complex and dynamic launch environment. (Author)

A71-20014 * **The power spectrum in project management.** Gary Gemmill and David L. Wilemon (Syracuse University, Syracuse, N.Y.). *Sloan Management Review,* vol. 12, Fall 1970, p. 15-25. 18 refs. NASA-supported research.

Discussion of the matrix form of project management, with particular emphasis upon the influence bases which project managers employ to gain the cooperation of support personnel and thus to secure services they need. The various sources of influence available to the project manager are examined, and the way they are used, the effect of each on project performance, and the organizational consequences of their different combinations are indicated. The

A71-20775 **Information flow in an industrial research laboratory - A case study.** Thomas K. Shotwell (Salsbury Laboratories, Charles City, Iowa). *IEEE Transactions on Engineering Management,* vol. EM-18, Feb. 1971, p. 26-33. 15 refs.

The flow of information to and within an industrial bioscience research laboratory has been studied through use of questionnaires and interviews. The scope of the study and difficulties encountered are described. Sources of ideas for product and procedural innovations, reading in scientific and technical literature, and the flow of information between departments are reported and related to published reports of similar studies. The possible impact of geographic and demographic factors and the effects of the unique mix of science and technology on research organizations are discussed. (Author)

A71-21720 # **Implications of advancing technology on needs for world meteorological information.** Werner A. Baum (Rhode Island, University, Kingston, R.I.). In: Meteorological observations and instrumentation; American Meteorological Society, Symposium, Washington, D.C., February 10-14, 1969, Proceedings. Edited by Sidney Teweles and James Giraytys. Boston, American Meteorological Society (Meteorological Monographs. Volume 11, No. 33), 1970, p. 51-55.

Meteorological information is a means toward an end, not an end in itself. The need for such information exists in a large and varied group of users. We must anticipate not only the progress in meteorology and the technology supporting it, but also the progress in the science and technology supporting each of our major user groups. This paper explores that progress and how it may be expected to affect future world requirements for meteorological information. (Author)

A71-21736 # **Necessary elements of an equipment development and test program.** Andrew S. Carten, Jr. (USAF, Cambridge Research Laboratories, Bedford, Mass.). In: Meteorological observations and instrumentation; American Meteorological Society, Symposium, Washington, D.C., February 10-14, 1969, Proceedings. Edited by Sidney Teweles and James Giraytys. Boston, American Meteorological Society (Meteorological Monographs. Volume 11, No. 33), 1970, p. 237-242.

The four essential elements in a successful meteorological equipment development and test program are identified and analyzed. The need for relevant technical objectives, based on a meaningful user/developer dialogue, is stressed. The concept of feasibility is a vital one, and its application is shown to be a determining factor in the direction which the program will take. The latter stage elements - the user's requirements statement and the development plan - are related to the earlier elements and are proven to be equally important. Cases drawn from the author's experience are used to illustrate the precepts advanced. (Author)

A71-21825 **The role of state government in aircraft noise abatement regulation.** Joseph R. Crotti (California Department of

critical-path methods. Optimization is effected after feasibility and priority considerations. A computer-assisted network scheduling system applies the modeling, optimizational, and priority requirements to the problems of the MSFN. The system is executed by IBM System/360 Model 95. G.R.

A71-24539 A funds allocation method to improve the odds for research successes. A. H. Bobis (Reflector Hardware Corp., Melrose Park, Ill.), T. F. Cooke, and J. H. Paden (American Cyanamid Co., Bound Brook, N.J.). *Research Management,* vol. 14, Mar. 1971, p. 34-49. 5 refs.

Description of a mathematical dynamic modeling method designed to offer assistance to management in their efforts to evaluate new research and development projects by making a quantitative decision of when and how much money should be spent on the projects. In the model which employs this method, the estimates and forecasts are provided as input information to a mathematical analog of the research process. Data concerning research expenditures to date and present sales levels are not included as part of the model. The attitude taken is that each project must be reconsidered at budgeting time and that money already expended is gone. The anticipated returns are, therefore, based only on research expenditures that are still required and the potential effect of the program on future sales and profits. Using this model, all of the projects are put in competition with each other for the available funds. The result is a five-year allocation of those funds across the projects. O.H.

A71-25257 # Concepts and mathematical methods of representing economic conditions and goals (Begriffe und mathematische Darstellungsweise ökonomischer Tatbestände und Ziele). Klaus-Jürgen Richter (Dresden, Hochschule für Verkehrswesen, Dresden, East Germany). *Technisch-ökonomische Informationen der zivilen Luftfahrt,* vol. 6, no. 9, 1970, p. 452-467, 477. 14 refs. In German.

Consideration of the problems of modeling the economic conditions and goals of a planned economy. The model concept is outlined, and its significance for scientific development, in general, and for the depiction of economic conditions and goals by mathematical expressions, in particular, is demonstrated. The actual process of modeling is described in detail. Scientific aids which play a special role in the mathematical modeling of economic conditions and goals are noted. The reliability of model predictions is discussed. A.B.K.

A71-26308 Aircraft maintenance. J. W. Norberg (Air Canada, Montreal, Canada). *Aeronautical Journal,* vol. 75, Mar. 1971, p. 153-158.

The philosophy underlying the achievement and sustaining of the airworthiness standard throughout the life of aircraft is outlined and the principal tasks in this field are specified. The respective prime processes involved are discussed. Determination, provisioning, and utilization of maintenance resources are examined. Basic elements of maintenance which constitute a system through which the maintenance task is accomplished are summarized. Finally, future maintenance requirements are briefly considered. O.H.

A71-26657 'Weibull' decreasing hazard rate - Help or hoax. Lyman Sessen (U.S. Army, Materiel Command, Washington, D.C.). In: Institute of Electrical and Electronics Engineers, Annual Symposium on Reliability, Washington, D.C., January 12-14, 1971, Proceedings. Symposium co-sponsored by the Institute of Environmental Sciences and the American Society for Quality Control. New York, Institute of Electrical and Electronics Engineers, Inc. (Annals of Assurance Sciences. Volume 4, No. 1), 1971, p. 28-37. 13 refs.

Frequently expressed ideas are shown to be fallacious, viz., that hazard rate significantly decreases indefinitely with age, that there exists no such thing as inherent (constant at specific stress) reliability which 'uninformed' (non-hip generation) engineers try to predict by calculation, and that the Government should accept equipment with high hazard rate all because some cumulative hazard rates versus age decrease and are approximated by straight lines (so called 'Weibull') on log-log paper. The Two-Line All-Equipments Test (TAT) and the Aeronautical Systems Division (ASD) reliability testing are analyzed using 'Weibull' Monte Carlo simulation. TAT is shown to be more effective than traditional MIL-STD-781B production acceptance testing in preventing the acceptance of infant mortality and precluding the necessity of a Government specified burn-in. ASD testing is shown to, in addition, encourage reliability improvement effort. It is shown that it is not cost effective to waive or adulterate reliability requirements except when unreliability is confined to a small percentage of a weapon system which is not critical to mission success. (Author)

A71-26669 Responsive reliability proposals in a tight market. Marvin B. Greenfeld (Bendix Corp., Communications Div., Baltimore, Md.). In: Institute of Electrical and Electronics Engineers, *Annual Symposium on Reliability, Washington, D.C., January 12-14,* 1971, Proceedings. Symposium co-sponsored by the Institute of Environmental Sciences and the American Society for Quality Control. New York, Institute of Electrical and Electronics Engineers, Inc. (Annals of Assurance Sciences. Volume 4, No. 1), 1971, p. 133-138. 6 refs.

Development of the case for improving industry competitive posture in proposing reliability programs in the existing difficult market environment. It is considered that bid requests containing reliability performance and test requirements have sometimes been both ambiguous and unreasonable for the type of equipment being specified. It is suggested that the military-electronics reliability segment of the electronics industry generate a set of standards of understanding of reliability performance requirements. F.R.L.

A71-26670 Workshop techniques for program audits. D. H. Crothers (TRW Systems Group, Redondo Beach, Calif.). In: Institute of Electrical and Electronics Engineers, Annual Symposium on Reliability, Washington, D.C., January 12-14, 1971, Proceedings. Symposium co-sponsored by the Institute of Environmental Sciences and the American Society for Quality Control. New York, Institute of Electrical and Electronics Engineers, Inc. (Annals of Assurance Sciences. Volume 4, No. 1), 1971, p. 139-144.

Use of workshop techniques to conduct effective program audits, bringing together various combinations of reliability managers, performers, and customers. Ideally, the workshop technique deemphasizes the traditional auditor's role and enlists a sense of company spirit as a response to discovered problems. The end result is potential use of the audit as a device to accomplish the retraining of both the individuals in the program being audited and the reliability people supporting them. F.R.L.

A71-26673 System evaluation and feedback data. E. F. Jahr (IBM Electronics Systems Center, Owego, N.Y.). In: Institute of Electrical and Electronics Engineers, Annual Symposium on Reliability, Washington, D.C., January 12-14, 1971, Proceedings. Symposium co-sponsored by the Institute of Environmental Sciences and the American Society for Quality Control. New York, Institute of Electrical and Electronics Engineers,

Inc. (Annals of Assurance Sciences. Volume 4, No. 1), 1971, p. 188-193.

Discussion of information processing and feedback procedures related to the data reported at system level. A reject notice designed as a primary source document is used for reporting discrepancies occurring at any hardware level. To assist in establishing priorities in rework or repair, the forms used in fabrication and assembly, system test, and field use are color coded and prenumbered with prefixes. The key to reporting system discrepancies is in the degree of sophistication of the computer programming for recall and report generation. A failure analysis report form is an adjunct to the reject notice. M.M.

A71-26677 A method of assessing the risks associated with reliability demonstration testing. Amy C. Spear (RCA, Aerospace Systems Div., Burlington, Mass.). In: Institute of Electrical and Electronics Engineers, Annual Symposium on Reliability, Washington, D.C., January 12-14, 1971, Proceedings. Symposium co-sponsored by the Institute of Environmental Sciences and the American Society for Quality Control. New York, Institute of Electrical and Electronics Engineers, Inc. (Annals of Assurance Sciences. Volume 4, No. 1), 1971, p. 269-277.

In responding to requests for proposals on fixed price procurements where one of the requirements will be demonstrating a predicted or specified equipment reliability, a contractor should make a very realistic assessment of the risk involved in order to provide maximum protection against the risks. This paper demonstrates a method of providing management with an assessment of the risks involved in accepting such a demonstration testing requirement and where they can most profitably spend their dollars to reduce the risk factors. (Author)

A71-26678 Economic formulation of reliability objectives. Herbert Hecht (Aerospace Corp., El Segundo, Calif.). In: Institute of Electrical and Electronics Engineers, Annual Symposium on Reliability, Washington, D.C., January 12-14, 1971, Proceedings. Symposium co-sponsored by the Institute of Environmental Sciences and the American Society for Quality Control. New York, Institute of Electrical and Electronics Engineers, Inc. (Annals of Assurance Sciences. Volume 4, No. 1), 1971, p. 280-284. 5 refs.

Whether he works on consumer products, in the public service area, or in the increasingly budget-conscious aerospace industry, the reliability engineer finds it necessary today to explain the objectives of his effort in economic terms. This paper describes some of the basic relations by which the interaction of reliability with economic parameters can be modeled. Specifically, it is shown how the cost of failure and the cost of failure prevention (reliability improvement) can be expressed in comparable terms, how an economically optimum reliability level can be defined, how the economic benefits of various improvements can be ranked, and how economic criteria can decide whether to spend a limited budget on reliability improvement or in other areas. (Author)

A71-26683 Screening for reliability growth. Robert W. Fink (General Electric Co., Utica, N.Y.). In: Institute of Electrical and Electronics Engineers, Annual Symposium on Reliability, Washington, D.C., January 12-14, 1971, Proceedings. Symposium co-sponsored by the Institute of Environmental Sciences and the American Society for Quality Control. New York, Institute of Electrical and Electronics Engineers, Inc. (Annals of Assurance Sciences. Volume 4, No. 1), 1971, p. 316-320.

The effectiveness of a screening program from parts procurement through system test is examined on the basis of experience obtained with the AN-APQ-113 attack radar system for the F-111 aircraft. It is shown how screening at all levels affects both reliability performance and profit levels. A Duane Growth Model, constructed to relate the impact of screening on system MTBF growth, is discussed. V.P.

A71-26684 Shillelagh reliability program development to deployment. Doren E. Curtiss and Thomas G. Ouellette (Philco-Ford Corp., Aeronutronic Div., Newport Beach, Calif.). In: Institute of Electrical and Electronics Engineers, Annual Symposium on Reliability, Washington, D.C., January 12-14, 1971, Proceedings. Symposium co-sponsored by the Institute of Environmental Sciences and the American Society for Quality Control. New York, Institute of Electrical and Electronics Engineers, Inc. (Annals of Assurance Sciences. Volume 4, No. 1), 1971, p. 321-327. 6 refs.

Brief discussion of aspects of the reliability program that contributed significantly to the success of the Shillelagh missile system. The dominant principles recognized for this program are: (1) firm customer support is an essential ingredient for any successful program; (2) the parts selection effort must begin early in design; (3) determining specific environmental criteria applicable to the system and subassemblies should be addressed vigorously from the beginning of the development phase; (4) reliability test programs should contain elements of continuity between development and production so that comparisons can be made; (5) attention paid to the processes used within the factory and suppliers' facilities will pay large dividends; (6) minor changes in design cannot be discouraged but must be adequately analyzed and qualified for the same reasons as are alternate suppliers; and (7) in any program, the key test points must be identified, data collected and summarized, and problems highlighted with traceability within the factory build-up cycle. M.M.

A71-26687 Failure prediction from interval data. J. D. Johnson and L. T. Stewart (Lockheed Research Laboratories, Palo Alto, Calif.). In: Institute of Electrical and Electronics Engineers, Annual Symposium on Reliability, Washington, D.C., January 12-14, 1971, Proceedings. Symposium co-sponsored by the Institute of Environmental Sciences and the American Society for Quality Control. New York, Institute of Electrical and Electronics Engineers, Inc. (Annals of Assurance Sciences. Volume 4, No. 1), 1971, p. 356-361.

Description of a method of analysis for reliability and inventory problems of the type: (1) the individual items in a population can be inspected for failure only at irregular times. When a failure is observed at the time of inspection, it is known only that the failure occurred during the time interval since the last inspection; the exact time of failure is unknown; and (2) for any given future calendar date, a confidence interval prediction for the total number of items that will have failed by that date is desired. The primary assumption for this method of analysis is that the failure ages for the items of the population are independent random variables with the same probability distribution. This method does not assume a constant failure rate for the items. Thus, the actual date of manufacture must be taken into account in predicting the total number of items that will have failed by some future calendar date. M.M.

A71-26690 Decision theory in reliability and project management. Robert N. Miller (TRW Systems Group, Redondo Beach, Calif.). In: Institute of Electrical and Electronics Engineers, Annual Symposium on Reliability, Washington, D.C., January 12-14, 1971, Proceedings. Symposium co-sponsored by the Institute of Environmental Sciences and the American Society for Quality Control. New York, Institute of Electrical and Electronics Engineers, Inc. (Annals of Assurance Sciences. Volume 4, No. 1), 1971, p. 376-382.

Illustration of the possibilities of statistical decision theory in the solution of a broad class of management and reliability related problems. The basic logical framework of the decision-theoretic approach is introduced, and some methods of solution which are widely applied and have optimal properties are presented. A simple example drawn from a situation in everyday living is provided to illustrate the computations and bring the abstract ideas into focus.

Applications of these methods to problems arising in the fields of project management and reliability are discussed. A means of viewing these areas within the structure of decision theory is established, and the flexibility of the techniques in a variety of situations is emphasized. The results of an application of such methods are discussed, together with examples of the types of decisions which follow from these results. A.B.K.

A71-27008 * Response strategies in a two-choice reaction task with a continuous cost for time. Richard G. Swensson (Bell Telephone Laboratories, Inc., Holmdel, N.J.) and Ward Edwards (Michigan, University, Ann Arbor, Mich.). *Journal of Experimental Psychology*, vol. 88, Apr. 1971, p. 67-81. 17 refs. USAF-supported research; Grant No. NGR-23-005-171.

Each trial of a two-choice task rewarded correct responses, but charged a cost proportional to the response time. Seven of the eight subjects in three experiments violated predictions of the random-walk-model and confirmed those of the fast-guess model by using only two response strategies in all conditions. Stimulus frequency and payoffs primarily determined which strategy a subject would adopt. M.V.E.

A71-27144 # Planning of transportation operations at AEROFLOT (Die Planung der Beförderungsleistungen bei der AEROFLOT). O. Ovchinnikov (Aeroflot, Soviet State Airlines, Moscow, USSR). *Technisch-ökonomische Informationen der zivilen Luftfahrt*, vol. 7, no. 2, 1971, p. 106-111. In German.

A new planning methodology introduced in Soviet civil aviation and adapted to the new system of economic planning is described. Principal objectives of this methodology and new planning criteria and parameters are discussed. Organizational principles adopted for plan preparation and fulfillment are outlined. O.H.

A71-27246 # Concepts for improving defense management. Vincent P. de Poix (U.S. Department of Defense, Office of Defense Research and Engineering, Washington, D.C.). *Defense Management Journal*, vol. 7, Spring 1971, p. 36-40.

Several approaches are suggested with the objective of simplifying and increasing the efficiency in the Defense organization for successfully bringing in programs, particularly the major weapon systems programs. The suggested measures include: elimination of bureaucracy; improvement of communications from the highest to the lowest organizatorial levels; adequate generalization of existing regulations to allow the program managers the freedom they need to do a proper job; pinpointing the responsibilities for each program; introducing a mission-oriented Defense organization rather than an organization oriented toward functions; improved training of program managers; elimination of specialized functions that have become individualized and separate activities outside the mainstream of engineering effort; elimination of superfluous management layers above the program manager; encouraging a trade-off perspective to simplify the process of weapon systems acquisition; and screening out excessive paper. Several examples are presented. O.H.

A71-27601 * # The promise of aeronautics. Leonard Roberts (NASA, Ames Research Center, Moffett Field, Calif.). *Astronautics and Aeronautics*, vol. 9, May 1971, p. 24-31. 12 refs.

Socioeconomic changes to be expected for the future are examined. It is pointed out that the industrially developed nations will have a greater and ever-increasing proportion of the public educated to the use of air travel and that this proportion will increasingly have the means to use it. The need for the development of faster long-range aircraft for travel to the developing continents of Asia, Africa, and South America and transportation requirements within these areas are considered. Factors mitigating against the full realization of potential growth are reviewed, including concern about undesirable side effects of air transportation, problems of airport access, and lack of profitability for new technological advances. Joint industry and government action of a few clearly defined goals is recommended, giving attention to problems of short-haul transportation and to vastly improved international long-haul transportation. G.R.

A71-27677 Materials for Air Force - 1980: An industry commentary. William J. Harris, Jr. (Association of American Railroads, Washington, D.C.). *(Air Force Materials Symposium, Miami Beach, Fla., May 18-22, 1970.) SAMPE Quarterly*, vol. 2, Apr. 1971, p. 22-26.

A brief review is presented of the development in the past years in the field of new metals and alloys, composites, and ceramic materials which were of primary importance to weapon systems. The various problems involved in using advanced materials in aircraft industry as replacements for more traditional materials and, in particular, the problem of reluctance in their acceptance, are examined. Innovations necessary in management of governmental programs, in procurement specifications, and in the contracting procedures of the Department of Defense are discussed. O.H.

A71-28030 * # Survey of space sciences operations research. Don N. Turner (NASA, Office of Manned Space Flight, Washington, D.C.). *Operations Research Society of America, Annual Meeting, 39th, Dallas, Tex., May 5-7, 1971, Paper.* 46 p.

The previous thirteen years of major NASA space activity are reviewed, and major NASA programs for the coming years are discussed. The critical elements to the future are the reusable space shuttle and the earth orbiting space station. The precursor to the large space station is the Skylab. The space shuttle is planned as a fully reusable two-stage vertical takeoff and horizontal landing space vehicle. Conceptual space station studies have led to a set of desired systems characteristics. A research and applications module (RAM) is to be delivered to orbit for operation. A program has been established for assuring that the space station and RAMs are arranged and have proper provisions for multidiscipline support. Operations analysis problems associated with the planning of future space missions are examined. G.R.

A71-28164 Society of the Plastics Industry, Annual Western Conference, 28th, Coronado, Calif., May 5-7, 1971, Proceedings. Los Angeles, Society of the Plastics Industry, Inc., 1971. 171 p. $7.00.

Recent advances in composite materials and filamentary-composite reinforcement of metal structures are reviewed, with special attention to their use in spacecraft and missiles. Polyimides, in particular, are considered for use in high temperature service, and potential structural applications to the space shuttle are discussed in the light of ongoing studies. M.V.E.

A71-28303 Flight crew training - A total concept. T. J. Layne and P. M. Morton (Boeing Co., Seattle, Wash.). *Society of Automotive Engineers, International Simulation and Training Conference, 4th, Atlanta, Ga., May 13, 1971, Paper 710474.* 31 p. Members, $1.00; nonmembers, $1.50.

To serve the requirements of the operational environment of

modern jet aircraft, the flight crew training program should be kept as simple as possible and be consistent with the total information system for aircraft operation of which it is a part. Systematic tools are described which assist the course developer in optimizing the implementation of Specific Behavioral Objectives, allocating learning elements to the most cost effective learning environment, and organizing those learning elements associated with the classroom environment. Included is a discussion on the management systems applied, the development of a Learning Task Analysis, and a systems approach to course organization. (Author)

A71-28307 Expansibility and economy of terminal structures. Jack D. Downey. *Society of Automotive Engineers, National Air Transportation Meeting, Atlanta, Ga., May 10-13, 1971, Paper 710418.* 5 p. Members, $1.00; nonmembers, $1.50.

Discussion of criteria and problems connected with the future design of airport terminals. It is pointed out that, in planning terminal structures, it must be recognized that economy and expansibility are corequirements and must be mutually involved. Four dimensions of terminal planning and construction should be considered. In addition to the usual dimensions of length, height, and width, time is an equally important component. The linear/unit terminal concept tends to wed these dimensions into a superior facility. The extensive use of dimensional planning can make a facility long-lived. M.M.

A71-28310 The economics of subsonic transport airplane design, evaluation and operation. Donald D. Hufford, James A. Ross, and Kenneth W. Hoefs (Boeing Co., Seattle, Wash.). *Society of Automotive Engineers, National Air Transportation Meeting, Atlanta, Ga., May 10-13, 1971, Paper 710423.* 12 p. 6 refs. Members, $1.00; nonmembers, $1.50.

The interactive and cyclical design, evaluation, and operational system that conceives transport airplanes is described. Some economic consequences of preliminary design variable choices are displayed, followed by an inspection of the 1967 ATA Method and actual direct operating costs. Uses and misuses of the formula costs, as compared to actual cost levels, are considered. Finally, the impact of airplane choice on airline profitability is examined. It is seen that the profit consequences are great enough to require careful attention to economic trades in every step of the design, evaluation, and operational process. (Author)

A71-28330 The costs/reliability relationships of development testing and demonstration. Kirk G. Rummel and Robert B. Aronson (Boeing Co., Vertol Div., Philadelphia, Pa.). *Society of Automotive Engineers, National Air Transportation Meeting, Atlanta, Ga., May 10-13, 1971, Paper 710452.* 10 p. Members, $1.00; nonmembers, $1.50.

This paper explores the relationships between the costs of developmental testing and the derived benefits in reliability. The analysis quantifies this relationship for the components of the dynamic system of a specific future helicopter. Distinctions are drawn between test costs related to reliability requirements and those that are not related. Emphasis is placed on the decisionmaking process that is required when formal reliability and maintainability (R & M) demonstration tests are imposed. The statistical aspects of demonstration tests are examined and related to the program manager's informational requirements. (Author)

A71-28492 # Contributions to socialist management - Information processing in the ordering of the Department of Material Supply (Inland) of INTERFLUG by means of equipment involving a medium degree of mechanization, and by an electronic data-processing machine (Beiträge zur sozialistischen Betriebsführung - Die Informationsverarbeitung im Bestellwesen der Materialwirtschaft (Inland) der INTERFLUG mit Hilfe von Geräten der mittleren Mechanisierung und einer EDVA). Rolf Siuda. *Technisch-ökonomische Informationen der zivilen Luftfahrt,* vol. 7, no. 3, 1971, p. 158-164. In German.

The processes involved in obtaining the materials required for the operation of the organization are shown. Equipment used for the necessary office work makes use of punched cards and punched tape. The various operations involved are discussed, and the savings possible by a mechanization of the work are examined. Data necessary for the process of ordering and data which can be obtained from the process are considered in connection with an evaluation regarding the most suitable approach for processing the data. G.R.

A71-28798 * The principles of motivation and how to apply them. George C. Bucher (NASA, Marshall Space Flight Center; Alabama, University, Huntsville, Ala.) and Richard C. Gray. *Research Management,* vol. 14, May 1971, p. 12-23. 12 refs.

Review of the theory of motivation techniques used in industry, most of which are based on Maslow's theory of the hierarchy of needs. It is considered that management can most effectively promote the motivation of scientific personnel through the establishment of personalized and equitable organizational policies and practices, and the selection of technically competent supervisory personnel who are made aware of the importance of good human relations. F.R.L.

A71-28799 * What makes technical men happy and productive. Fred Landis (New York University, New York, N.Y.). *Research Management,* vol. 14, May 1971, p. 24-42. Grant No. NGR-33-016-067.

The data presented are based on both interviews with engineering management in a number of companies and on an extensive confidential questionnaire survey which were conducted during 1968. The survey covered twelve manufacturing, design and research organizations in various fields of engineering. The subjects discussed are related to the nature of the work effort, time and intellectual changes, time spent on nonengineering tasks, performance measurements, motivational factors, the hierarchy of needs, and the aspects of the relation between the individual and his company. It is concluded that the majority of engineers are fairly well utilized. They are satisfied with their jobs and find their capabilities matched. There remains, however, a strong minority which is intellectually underchallenged. Better work planning and a better appreciation of professional aspirations could greatly improve overall engineering utilization in these cases. G.R.

A71-28800 Current and future factors affecting the motivation of scientists, engineers and technicians. Earl R. Gomersall (Texas Instruments, Inc., Dallas, Tex.). *Research Management,* vol. 14, May 1971, p. 43-50.

Indication that the social-economic conditions of the near future will require knowledge of motivation theories and techniques which must be comparable to that required in basic technological disciplines. It is considered that when applying motivation techniques there are important differences between scientists, engineers and technicians that must be taken into account. F.R.L.

A71-28895 * # Logistics planning for phased programs. John C. Goodrum (NASA, Marshall Space Flight Center, Advanced Program Support Office, Huntsville, Ala.). *Operations Research Society of America, Annual Meeting, 39th, Dallas, Tex., May 5-7,*

1971, Paper. 13 p.

Discussion of the proper and early integration of logistics planning into the phased program planning process as a means of drastically reducing logistic costs. Phased planning involves preliminary analysis, definition, design, and development/operations. It is shown that each hardware program is different, not only because of differences in configuration and operational intent, but because of the program management structure, budgetary constraints, etc.

F.R.L.

A71-29551 # **Operations research analysis of aircraft noise abatement.** Edward B. Ahlers (IIT Research Institute, Chicago, Ill.). *American Institute of Aeronautics and Astronautics, International City Management Association, National League of Cities, and U.S. Conference of Mayors, Urban Technology Conference, New York, N.Y., May 24-26, 1971, AIAA Paper 71-525.* 8 p. Members, $1.50; nonmembers, $2.00. Research sponsored by the Air Transport Association of America and the Aerospace Industries of America.

Methods are developed for computing relative costs of various combinations of countermeasures for reducing community noise exposures to various levels in a national system of airport communities by extrapolation from a statistically significant sample of airports. The procedures can be used to seek the minimum-cost of alternate near-minimum cost combinations of countermeasures. Measures for estimating the probable error of problem solutions are incorporated in the formulation. Printed output includes: total costs for reducing noise exposures to various levels and costs associated with engine modifications, airframe modification, operation changes, increments in direct operating costs, and land-use changes. M.V.E.

A71-29852 Development of organizational climate inventories for use in R & D organizations. Robert W. Stephenson (American Institutes for Research, Silver Spring, Md.), Benjamin S. Gantz (Smith-Richardson Foundation, Greensboro, N.C.), and Clara E. Erickson (U.S. Naval Weapons Center, China Lake, Calif.). *IEEE Transactions on Engineering Management,* vol. EM-18, May 1971, p. 38-50. 46 refs.

Three questionnaires were completed by 109 employees of a government R & D laboratory and 121 employees from 28 industrial R & D organizations. In one questionnaire the respondents expressed their opinions about obstacles and incentives to creativity in the organizations at which they worked; in another they indicated 'actual' and 'ideal' levels of risk-taking situations in their organizations; and in the third they indicated to what extent 15 statements about conflicting objective situations were characteristic of their organizations. The answers seemed to indicate that at the government laboratory there were fewer obstacles to creativity than in industry, that risks were taken oftener at the government laboratory than in industry, and that conflicting objective situations differed between the government laboratory and industry. (Author)

A71-29853 * **Managing the development of an experimental computer-aided technology planning system (PLANET).** Milan J. Krasnican (NASA, Office of Advanced Research and Technology, Advanced Concepts and Missions Div., Washington, D.C.). *IEEE Transactions on Engineering Management,* vol. EM-18, May 1971, p. 50-57. 21 refs.

PLANET is an experimental planning tool for integrating technology plans and evaluating potential resource allocations to mission-oriented technology programs. Its objectives include improvement of manual planning with a computer-aided model, speedier and more consistent response to queries, assessment of impact of proposed program changes, introduction of explicit subjective judgment, and improved visibility into the planning process. The management environment is that of a planning staff in a HQ program office in a government R & D agency. Contractor assistance in PLANET system development was provided. PLANET development consisted of a study and implementation phase and included formulation of an objective function, development of a mission-oriented easily accessed data base, definition of options to be examined, development of relationships between future candidate missions, allied technologies, and project plans, generation of quantitative subjective value inputs, application of algorithms, software development including output formats and utility programs, and PLANET system testing. M.M.

A71-29854 Organizations of unsuccessful R & D projects. William B. Joyce (Bell Telephone Laboratories, Inc., Murray Hill, N.J.). *IEEE Transactions on Engineering Management,* vol. EM-18, May 1971, p. 57-65. 12 refs.

This paper discusses the organization and the criterion for funding of an applied research project that can be regarded as a collection of necessary but potentially unsuccessful tasks. Each task might be successfully achieved by any of a number of alternative approaches. Each alternative approach can be regarded as a collection of necessary but potentially unsuccessful subtasks. Each subtask consists of subalternatives, etc. A comparatively simple procedure is given for selecting which projects to fund, for estimating various expected expenditures, and for determining that order of carrying out the tasks, alternatives, subtasks, etc., of a project that minimizes the project's expected cost. The procedure takes into account the possibility that the project may fail and be abandoned before all tasks, subtasks, etc., are performed and the possibility that engineering considerations may exclude some economically desirable task orderings. A number of industrial practices are discussed from this viewpoint. (Author)

A71-29855 Analysis of some portfolio selection models for R & D. A. E. Gear, A. G. Lockett, and A. W. Pearson (Manchester Business School, Manchester, England). *IEEE Transactions on Engineering Management,* vol. EM-18, May 1971, p. 66-76. 17 refs. Research supported by the Ministry of Technology and the United Kingdom Atomic Energy Commission.

This paper presents an analytical review of mathematical programming models that have been proposed as aids to the related problems of resource allocation and project selection in R and D. The models are classified according to whether they are based on linear, integer, chance constrained, or dynamic programming. Representative examples from these classes are described and evaluated in detail. The evaluation is in terms of data requirements; built-in assumptions; ease of computation; usefulness of outputs; versatility of application. (Author)

A71-30159 # **The total transport demand.** Gabriel Bouladon. In: Aviation's place in transport; Royal Aeronautical Society, Two Day Convention, London, England, May 12, 13, 1971, Proceedings. London, Royal Aeronautical Society, 1971. 11 p.

Examination of the possibility that transport and travel demand will become a future economic constant, such as housing, clothing, and food. It appears that in the USA transport consumption in miles per capita doubles every 24 years. The rate of travel expansion is even greater in Europe and Japan. The basic motivations for travel are psychological, sociological, and economic. A progressive price increase in air transport of around 15% over the next 12 years may be expected, due to the fight against pollution and other problems.

F.R.L.

A71-30165 # **Aviation within the total transport system.** Keith Legg (Loughborough University of Technology, Lough-

borough, Leics., England). In: Aviation's place in transport; Royal Aeronautical Society, Two Day Convention, London, England, May 12, 13, 1971, Proceedings. London, Royal Aeronautical Society, 1971. 22 p. 13 refs.

Consideration of the broad transport issues that follow from detailed study of transport demand, communications and future air transport prospects, because it is here that the greatest difficulty seems to be encountered in making good decisions. It is suggested that transport policy, organization and decision must be coordinated and originate from the highest level within a framework of systematic overall studies which define the constraints and resource limitations within which the total transport system must operate. It is emphasized that the purpose of transport is to satisfy social demand and it must do this with the minimum of inconvenience to the nonuser. F.R.L.

A71-30261 U.S./European cooperation for manned space projects - Will it come. Jürgen Lambrecht. In: Space stations; American Astronautical Society, Annual Meeting, 16th, Anaheim, Calif., June 8-10, 1970, Proceedings. Edited by Lewis Larmore and R. L. Gervais. Tarzana, Calif., American Astronautical Society (Advances in the Astronautical Sciences. Volume 27), 1970, p. 377-384. 6 refs.

It is shown that a Europe including the Common Market countries plus Great Britain would have a slightly greater potential for space activities than the USSR on the basis of a population about equal to that of the Soviet Union and a GNP which is somewhat higher. However, present European space efforts are comparatively very small. A large scale US-European space cooperation at present is thought unlikely. It would require a major increase in the European space budgets and the abandonment at least in part of the independent European space program. These conditions would only be met if Europe's participation as a real partner of the U.S. were ensured, and if a climate could be created which will make the European taxpayer willing to spend more money on space activities. The real advantage for the U.S. of a cooperation in space lies in the possibility to form one additional strong tie with Europe. G.R.

A71-30728 # A systems approach to engine condition monitoring. K. B. Kochanski and D. W. Leiby (General Electric Co., Cincinnati, Ohio). *American Institute of Aeronautics and Astronautics and Society of Automotive Engineers, Propulsion Joint Specialist Conference, 7th, Salt Lake City, Utah, June 14-18, 1971, AIAA Paper 71-652.* 10 p. Members, $1.50; nonmembers, $2.00.

A condition-monitoring-maintenance concept is being considered or proposed for almost all new commercial or military aircraft. The complexity of jet engines, the engine/aircraft interfaces, and the marriage of airborne instrumentation and electronic equipment with ground based electronic/computer hardware requires the use of a systems approach for the development and implementation of a condition monitoring system. This paper describes how a systems approach has been used in developing condition monitoring techniques for the CF6 engine as a means of having a workable and effective condition monitoring capability available early in its service operation. (Author)

A71-30824 Conceptual lines for the definition of an aeronautical project (Linee concettuali per la definizione di un progetto aeronautico). Gian Battista Nicolò (Napoli, Università, Naples, Italy) and Licio Giorgieri (Trieste, Università, Trieste, Italy). *L'Aerotecnica - Missili e Spazio,* vol. 50, Feb. 1971, p. 73-84. In Italian.

The criteria to be followed in order to convert operational targets into actual requirements and technical specifications are outlined, attaching the utmost importance to the achievement of optimal cost effectiveness. A rational scheme of research, which has been applied successfully to the definition of the multinational, multirole combat aircraft MRCA, is described in its general lines and complexities. The setting up of a parametric analysis, which constitutes the central phase of the research, through which requirements and specifications are correlated in the most feasible solution, is described in detail. M.M.

A71-31130 Needed - More flexibility in major weapons R & D. Timothy D. Desmond (U.S. General Accounting Office, Washington, D.C.). *National Contract Management Journal,* vol. 5, Spring 1971, p. 55-62. 17 refs.

It is argued that a more flexible, economical response to defense needs can be mounted by more emphasis on component and subsystem experimentation without having specifically identified weapons in mind. This means that less emphasis should be placed on optimized weapon systems for which components are specifically designed, and more attention should be given to applied research - Exploratory and Advanced Development - of component and subsystem concepts. O.H.

A71-31131 Delayed payments under contract stretch-out. Frank Reda. *National Contract Management Journal,* vol. 5, Spring 1971, p. 63-70. 23 refs.

A discussion is presented of the nature and legal aspects of the so-called 'value' of delayed payments under government contracts, claimed by contractors to be reimbursed as part of the adjustment for the stretch-out of a contract. It is concluded that there is no apparent justification for recognizing this contractor's claim. Whether viewed as interest or as profit, this new type of claim is not tenable under current procurement concepts. O.H.

A71-31132 Pricing and contracting for inflation. Harold E. Sharp (McDonnell Douglas Astronautics Co., Huntington Beach, Calif.). *National Contract Management Journal,* vol. 5, Spring 1971, p. 87-107.

Methods used to provide for the contingency of inflation are reviewed. It is shown that pricing for inflation is done statistically or by direct estimating or a combination of the two. Two methods used to construct a 'best fit' line through historical data for a selected period and to project this line into future periods - i.e., the so-called linear and the nonlinear method - are characterized and compared. The so-called labor rate forecast direct method, which is a direct estimating method, is also described. Several types of contractual arrangements for avoiding contingency pricing for inflation are examined, and cost escalation clauses are discussed. It is suggested that on procurements involving sizeable expenditures in the future, it is reasonable to provide both the customer and contractor coverage for abnormal fluctuations, not all or any fluctuation, of future costs arising from conditions beyond the contractor's control. Some general recommendations, primarily oriented to the aerospace industry, are presented. O.H.

A71-31133 Commercial application of government research and development output. Isidore J. Masse (Brock University, St. Catherines, Ontario, Canada). *National Contract Management Journal,* vol. 5, Spring 1971, p. 109-122. 9 refs.

The purpose of this paper is threefold: first, to ascertain the extent to which spinoff from government-sponsored research and development affects measured productivity; second, to determine which industries benefit the most from spinoff; and, third, to determine whether large-sized firms are more favored in the distribution of government research and development funds to the private sector. The conclusions which can be drawn from the study are as follows: first, spinoff favors goods and processes of production

which affect measured productivity; second, some industries derive much more benefit through spinoff than do other industries; and, third, while firms classified as large receive the major proportion of government research and development funds, regression analysis indicates that the relationship is not uniform for all industries and, within any given industry, the government does not appear to favor the largest-sized firms. (Author)

A71-31134 'The management of change' - A catchword or an opportunity. James S. Reece (Harvard University, Cambridge, Mass.). *National Contract Management Journal*, vol. 5, Spring 1971, p. 123-137. 12 refs.

Problems of improving control over the costs of the many changes that occur in major defense weapons systems between the time the original contract is signed and delivery of the final hardware are discussed. It is shown that there are opportunities for improving cost management on these many changes; they include more timely incorporation of changes into cost control systems, reducing the number of high-cost retrofits, and focusing on the relatively few change actions that account for the bulk of change costs. However, collecting the actual costs of every change does not seem to be practical or useful approach to controlling change costs. None of these improvements will be realized, however, until the focus of program management is shifted from funds control to cost control. O.H.

A71-32247 Airport planning for environmental quality. Robert F. Bacon (FAA, Airport System Planning Div., Washington, D.C.). In: Society of Automotive Engineers and U.S. Department of Transportation, Conference on Aircraft and the Environment, Washington, D.C., February 8-10, 1971, Proceedings. Part 2. New York, Society of Automotive Engineers, Inc., 1971, p. 58-63.

Consideration of the numerous problems involved in planning for environmental quality. Airport operators are concerned that the multitude of environmental protection laws and policies will prevent solving the airport dilemma. In some cases minimizing the adverse effects of the environmental changes and the employment of unique impact lessening techniques may not produce an acceptable solution in the eyes of a substantial number of citizens. The role of the area-wide planning agency, and the FAA's planning grant program are discussed. A typical environmental study is outlined, and the FAA's environmental responsibilities are considered. F.R.L.

A71-32248 Planning for compatibility of aircraft and environment. Robert C. Einsweiler. In: Society of Automotive Engineers and U.S. Department of Transportation, Conference on Aircraft and the Environment, Washington, D.C., February 8-10, 1971, Proceedings. Part 2. New York, Society of Automotive Engineers, Inc., 1971, p. 64-70.

Exploration of aircraft/environment compatibility, with discussion of the decision-making process. Four sets of different viewpoints are examined which cause those involved in airport decisions to talk past each other or fail to agree on the meaning and importance of selected facts. These viewpoint sets are comprehensive-functional, federal-local, gainers-losers, and public-private. Based on these considerations, actions are suggested to be taken in three phases of the decision-making process: (1) airport system planning including airport site location, (2) airport master planning and development, and (3) airport operation. F.R.L.

A71-32249 Communities act to reduce the impact of jet aircraft noise. William Goedike. In: Society of Automotive Engineers and U.S. Department of Transportation, Conference on Aircraft and the Environment, Washington, D.C., February 8-10, 1971, Proceedings. Part 2. New York, Society of Automotive Engineers, Inc., 1971, p. 71-78.

This paper describes what communities have done and can do to reduce the impact of aircraft noise. Specifically, the historical action of Hempstead, New York, the Ten Point Program of Inglewood, California, and the International Airport development at Kansas City, Missouri, are outlined in some detail. Also, the paper presents an integrated plan for achieving a reasonable noise environment in the future. The plan is based on establishment of nationwide goals, on improved communication and decision making between communities and airports, and on a new concept of economic incentives which makes noise pollution a cost factor in industry decision making. (Author)

A71-33301 A method of synthesizing repair times. W. R. Downs (McDonnell Douglas Astronautics Co., Huntington Beach, Calif.) and C. Kasparian. In: Annals of reliability and maintainability. Volume 10 - Assurance technology relates to today's world; Proceedings of the Tenth Reliability and Maintainability Conference, Anaheim, Calif., June 27-30, 1971. Conference sponsored by the American Society of Mechanical Engineers, the Society of Automotive Engineers, and the American Institute of Aeronautics and Astronautics. New York, American Society of Mechanical Engineers, 1971, p. 178-180.

Presently published methods or approaches for maintainability prediction do not provide an easily manageable method for contract end item repair time distribution prediction from individual part distributed repair time estimates. The proposed method assumes that the individual predicted repair or replace times follow a logarithmic-normal distribution. The major advantage of using distributed times is that the contract end item or system maintainability prediction takes the form of a distribution rather than a mean time (average) value. Having a distribution of maintenance time permits more valid consideration of the relationship between probability of repair and time available for repair. Advantages inherent in the propounded method include: the ability to readily synthesize a system repair time distribution based on the median and maximum predicted repair times for its elements; ease of determining the percentage contribution of each repair time to the total; and the ability to utilize the computer to shorten the synthesis time for contract end items or systems incorporating a large number of repair modes. (Author)

A71-33307 Role of life cycle costing in fleet planning decisions. W. C. Messecar (Pan American World Airways, Inc., New York, N.Y.). In: Annals of reliability and maintainability. Volume 10 - Assurance technology relates to today's world; Proceedings of the Tenth Reliability and Maintainability Conference, Anaheim, Calif., June 27-30, 1971. Conference sponsored by the American Society of Mechanical Engineers, the Society of Automotive Engineers, and the American Institute of Aeronautics and Astronautics. New York, American Society of Mechanical Engineers, 1971, p. 236-240.

Description of a systems approach to flight equipment decisions based on four major problem elements: revenue, cost, investment, and passenger/cargo service. Each proposed aircraft retirement or purchase is evaluated as to its impact on these four elements. Life cycle costs are accounted for in both the operating cost and investments required for flight equipment and related ground equipment. Examples of the relative importance of these cost elements in current flight equipment decisions are given, as well as examples on the importance of these costs in considering various service alternatives for a single aircraft type. F.R.L.

A71-33309 * Safety inputs to development program plans. Leslie W. Ball and Robert G. Penny (NASA, Marshall Space Flight Center, Huntsville, Ala.). In: Annals of reliability and maintainability. Volume 10 - Assurance technology relates to today's world; Proceedings of the Tenth Reliability and Maintainability Conference,

Anaheim, Calif., June 27-30, 1971. Conference sponsored by the American Society of Mechanical Engineers, the Society of Automotive Engineers, and the American Institute of Aeronautics and Astronautics. New York, American Society of Mechanical Engineers, 1971, p. 278-285.

Consideration of the mechanics of integration of system safety engineers into a contractor's over-all system engineering process through basic development program plans. These plans involve program management, engineering management, integration test, manufacturing management, and integrated logistic support. A separate safety engineering plan is desirable because it provides a convenient means for the safety engineering specialist to identify and describe the critical activities and techniques that he recommends for achieving safety. It also helps safety personnel to bring together the safety aspects of the five basic function program plans into one convenient document. F.R.L.

A71-33311 Generalized procedure for evaluation of maintenance aids. Wilson F. Ford (U.S. Army, Picatinny Arsenal, Dover, N.J.) and Joseph W. Foster (Texas A & M University, College Station, Tex.). In: Annals of reliability and maintainability. Volume 10 - Assurance technology relates to today's world; Proceedings of the Tenth Reliability and Maintainability Conference, Anaheim, Calif., June 27-30, 1971. Conference sponsored by the American Society of Mechanical Engineers, the Society of Automotive Engineers, and the American Institute of Aeronautics and Astronautics. New York, American Society of Mechanical Engineers, 1971, p. 291-300. 8 refs.

Description of a generalized procedure which considers criteria which should be evaluated for any maintenance aid before deciding whether or not to adopt it. The most prominent criterion is cost, to which a complete and general model is devoted. The cost model is based upon the present worth of life-cycle cost, and results in a total cost for each alternative being evaluated. The procedure is intended for use in government contracting or industrial decision making. F.R.L.

A71-33313 Premature performance of scheduled maintenance. K. G. Barnes (United Air Lines, Inc., San Francisco, Calif.). In: Annals of reliability and maintainability. Volume 10 - Assurance technology relates to today's world; Proceedings of the Tenth Reliability and Maintainability Conference, Anaheim, Calif., June 27-30, 1971. Conference sponsored by the American Society of Mechanical Engineers, the Society of Automotive Engineers, and the American Institute of Aeronautics and Astronautics. New York, American Society of Mechanical Engineers, 1971, p. 318-327.

Study of the question of whether or not a device, structure, or system should be overhauled or replaced after the need for unexpected repair work occurs, even though overhaul or replacement would not normally be due until many more cycles of operation. A model is provided which considers duplication between repair cost and overhaul/replacement cost as the motivation for premature overhaul or replacement, and employs dynamic programming techniques to compute a cut-off value for the amount of duplication necessary to justify overhaul or replacement. It is considered that a specifically defined test ratio should be used to decide whether premature overhaul/replacement is advisable after an unexpected repair. F.R.L.

A71-33315 * Status of life testing, stress testing, and failure analysis and corrective action. William M. Bland, Jr. (NASA, Manned Spacecraft Center, Reliability and Quality Assurance Office, Houston, Tex.). In: Annals of reliability and maintainability. Volume 10 - Assurance technology relates to today's world; Proceedings of the Tenth Reliability and Maintainability Conference, Anaheim, Calif., June 27-30, 1971. Conference sponsored by the American Society of Mechanical Engineers, the Society of Automotive Engineers, and the American Institute of Aeronautics and Astronautics. New York, American Society of Mechanical Engineers, 1971, p. 403-408.

Description of the three tasks with statement of the purpose of each, listing of related references and literature, and identification of areas for continuing development. It is considered that discussion of areas for continuing development will lead to possible significant solutions in improving the effectiveness of accomplishing these tasks from both technical and cost positions. Amplification of each of these areas is provided in an appendix. F.R.L.

A71-33318 Development of a human performance reliability data system. David Meister (Bunker-Ramo Corp., Westlake Village, Calif.) and Robert G. Mills (USAF, Aerospace Medical Research Laboratories, Wright-Patterson AFB, Ohio). In: Annals of reliability and maintainability. Volume 10 - Assurance technology relates to today's world; Proceedings of the Tenth Reliability and Maintainability Conference, Anaheim, Calif., June 27-30, 1971. Conference sponsored by the American Society of Mechanical Engineers, the Society of Automotive Engineers, and the American Institute of Aeronautics and Astronautics. New York, American Society of Mechanical Engineers, 1971, p. 425-439. 11 refs.

A study was performed to determine the requirements for and the elements of a human performance reliability (HPR) data system. The heart of the HPR system is a taxonomic structure for classifying behavioral studies. 140 studies from a variety of sources were coded using this taxonomy. To test the efficiency of this data bank to provide answers to system development questions a number of tests were performed to determine the relevance of the data retrieved to the questions asked. The results of these tests indicated that it is possible to expand the HPR data base provided one is not restricted to a probabilistic metric. (Author)

A71-33584 International organization for space communications. J. A. Johnson (Communications Satellite Corp., Washington, D.C.). In: Organizing space activities for world needs; International Academy of Astronautics, International Astronautical Congress, 19th, New York, N.Y., October 13-19, 1968, Proceedings. Edited by E. A. Steinhoff. Oxford, Pergamon Press, Ltd., 1971, p. 201-210.

Cooperation in the commercial utilization of space communications is achieved through the International Telecommunications Satellite Consortium (Intelsat). A brief review of the international legal order within which Intelsat was established is presented, giving attention to the principle of the freedom of outer space. The first of two interrelated Intelsat agreements is an agreement among governments expressing the objectives to which all of the signatories are committed, as well as defining the structural framework of the organization. The second agreement, called the Special Agreement, deals with the financial and operational aspects of Intelsat, including such matters as the sharing of costs and revenues, and the establishment of charges for use of the Intelsat satellites. G.R.

A71-33587 Organization and management of space exploration. E. P. Wheaton and G. E. Meloy (Lockheed Missiles and Space Co., Sunnyvale, Calif.). In: Organizing space activities for world needs; International Academy of Astronautics, International Astronautical Congress, 19th, New York, N.Y., October 13-19, 1968, Proceedings. Edited by E. A. Steinhoff. Oxford, Pergamon Press, Ltd., 1971, p. 249-254.

Programs for cooperation in space can be bilateral or multilateral. NASA operates by far the most active bilateral cooperative space program. By capitalizing on the inherent scientific and

technical capabilities of the cooperating nations, this program has produced far more outstanding scientific results than would be indicated by its modest cost. Joint sounding rocket experiments conducted by NASA and Argentina have led to the Interamerican Meteorological Network. The exchange of weather satellite pictures between the world meteorological centers in Washington and Moscow is another example of bilateral cooperation. In managing a cooperative satellite program both NASA and the cooperating country designate program managers who become co-chairmen of a joint working group, the overall managing body. Multilateral programs in connection with communication satellites are discussed, and organization and management techniques involved are described.
G.R.

A71-33590 The economics of the space program. K. P. Heiss (Mathematica, Inc., Princeton, N.J.). In: Organizing space activities for world needs; International Academy of Astronautics, International Astronautical Congress, 19th, New York, N.Y., October 13-19, 1968, Proceedings. Edited by E. A. Steinhoff. Oxford, Pergamon Press, Ltd., 1971, p. 461-470. 13 refs.

The effects of the space program on the economy are examined, giving attention to the direct benefits of space applications, the spending effect, and the byproduct effect. Questions of economic planning and organization of space programs are investigated, taking into account the choice of space activities and the level of funding over time. The advantages of manned vs unmanned space capabilities are considered. G.R.

A71-34157 Fast, quality production at low cost. Corwin H. Meyer, Bill Lamberta, and Joseph L. Cipp (Grumman Aerospace Corp., Bethpage, N.Y.). *Grumman Horizons,* vol. 9, 1970, p. 38-43.

The philosophy governing product manufacturing for the F-14 aircraft aims at speeding up the work flow by reducing the scope and number of tasks in final assembly and by placing them farther back in the subassembly buildup. The aircraft will be built on a modular basis. Each major structural component of the aircraft will be a self-contained unit, completed as an end-product configuration. Each major module will be assembled and tested in its own area so that upon completion, it will be functionally ready for joining and final assembly. Built-in producibility features which help attain minimum manufacturing cost include modular airframe construction, cast canopy frames, a split cockpit section, a flat-walled fuselage centerbody, a simple hinged wing flap, limited use of machined titanium bulkheads, an integrated wire termination system, high-density harnessing, selective equipment locations, an electronic data automation system, and automatic circuit checkout. T.M.

A71-34618 Managing the development of large software systems - Concepts and techniques. Winston W. Royce (TRW Systems Group, Redondo Beach, Calif.). In: Institute of Electrical and Electronics Engineers and Western Electronic Manufacturers Association, Western Electronic Show and Convention, Los Angeles, Calif., August 25-28, 1970, Proceedings. North Hollywood, Calif., Western Periodicals Co. (WESCON Technical Papers. Volume 14), 1970, p. A/1 1-A/1 9.

Exposition of various aspects of managing large software developments as viewed after extensive experience. There are, it is considered, five steps which are necessary to transform a risky development process into one that will provide the desired product. These are (1) complete program design before analysis and coding begins, (2) documentation which is current and complete, (3) the job should be done twice if possible, (4) testing must be planned, controlled, and monitored, and (5) the customer must be involved. It is emphasized that the costs involved in this five-step process are far less than those that would be expended for recovery should the projected development fail. F.R.L.

A71-34620 * Managing the development of large software systems - Apollo real-time control center. James C. Stokes (NASA, Manned Spacecraft Center, Houston, Tex.). In: Institute of Electrical and Electronics Engineers and Western Electronic Manufacturers Association, Western Electronic Show and Convention, Los Angeles, Calif., August 25-28, 1970, Proceedings. North Hollywood, Calif., Western Periodicals Co. (WESCON Technical Papers. Volume 14), 1970, p. A/3 1-A/3 15.

Discussion of the management of the activities associated with the development, implementation, integration, testing, operation, and maintenance of a large software system. In particular, the management of the activities that are relative to the mission-support programs in the Real Time Computer Complex of the Mission Control Center at the NASA Manned Spacecraft Center is considered. The management techniques are characteristic of those used in the development of other software systems and, it is believed, they are applicable to the development of any large software system.
F.R.L.

A71-34702 An experimental evaluation of a method for simplifying electronic maintenance. Thomas K. Elliott and Reid P. Joyce (Applied Science Associates, Inc., Valencia, Pa.). *Human Factors,* vol. 13, June 1971, p. 217-227. 10 refs. USAF-supported research.

Experiments are described that demonstrate the ability of a technician with little or no training in electronic theory to perform effectively in an operational setting if he is totally dependent on a proceduralized troubleshooting guide to 'tell him every move to make.' 'Proceduralized troubleshooting' denotes a simplified method for isolating malfunctions in technical equipment and for providing a preset routine that controls the selection and sequence of tests and checks so that the result of each test and check determines which test or action is performed next. The job simplification resulting from this technique can be expected to improve performance reliability and widen the pool of available personnel by lowering aptitude requirements for job entry. Of great importance is also the promise of substantial reduction in technician training costs. M.V.E.

A71-34728 * # Conceptual studies of research and applications modules. W. L. Breazeale (NASA, Marshall Space Flight Center, Huntsville, Ala.) and J. T. Milton (NASA, Manned Spacecraft Center, Houston, Tex.). *American Institute of Aeronautics and Astronautics, Space Systems Meeting, Denver, Colo., July 19, 20, 1971, Paper 71-813.* 7 p. Members, $1.50; nonmembers, $2.00.

The results of several experiment module studies are summarized. Each study resulted in the conceptual design of a set of 'common' modules that would accommodate a multidisciplinary candidate experiment program. To reduce program costs, commonality, primarily in the subsystems of the modules, was a design goal. The mode selection criteria, commonality approach, and the module concepts are discussed. The major differences in the module concepts and the approach to commonality are attributed to differences in interpretations of the experiment requirements and in the Space Station and Space Shuttle capabilities and interfaces. The results indicate that subsystem commonality can be achieved within the module set. (Author)

A71-34733 * # The economics of a new space transportation system. Robert N. Lindley (NASA, Washington, D.C.). *American Institute of Aeronautics and Astronautics, Space Systems Meeting, Denver, Colo., July 19, 20, 1971, Paper 71-806.* 6 p. Members, $1.50; nonmembers, $2.00.

A new transportation system studied by NASA, the major elements of which are the Space Shuttle, a fully reusable two-stage system for transporting payloads between the earth's surface and low earth orbit, and a reusable Space Tug, used for operations between the space shuttle's orbit and high energy orbits, is considered. Economic considerations underlying the development of this system are outlined, and its costs are examined. An analysis seems to indicate that the direct cost of space activity to a shuttle-owning nation will be about one half of the direct cost to a nation relying on expendable launch systems. The nonrecurring costs associated with becoming a shuttle-owning nation are shown by contemporary economic theory to be justified if the nation intends to operate a space program with a level of activity represented by about forty shuttle flights per year. O.H.

A71-34961 # **Determination of the reliability parameters of the complex of technical means in an automated system of discrete-production management (Opredelenie parametrov nadezhnosti kompleksa tekhnicheskikh sredstv sistemy avtomatizirovannogo upravleniia diskretnym proizvodstvom).** A. S. Grinberg, M. B. Katsnel'son, and E. P. Tereshko. In: Utilization of redundancy in information systems (Ispol'zovanie izbytochnosti v informatsionnykh sistemakh). Edited by N. A. Zheleznov. Leningrad, Izdatel'stvo Nauka, 1970, p. 106-116. 15 refs. In Russian.

The loss sources in discrete production are analyzed, and quality of the mutual performance of the management personnel subsystem and the complex of technical means which represents the control system of the plant is analyzed. Use is made of an entropy method of analyzing the performance quality of the control system. A reliability index is introduced for the control system elements. The permissible entropy level which ensures effective performance of the system is determined for the individual subsystems. The required reliability indices of the technical means of control are also determined. V.P.

A71-35057 * # **Man's role in integrated vehicular information management systems.** J. L. Nevins and I. S. Johnson (MIT, Cambridge, Mass.). In: Institute of Navigation, National Space Meeting on Space Shuttle - Space Station - Nuclear Shuttle Navigation, NASA Marshall Space Flight Center, Huntsville, Ala., February 23-25, 1971, Proceedings. Washington, D.C., Institute of Navigation, 1971, p. 107-137. Contract No. NAS 9-4065.

Discussion of a new class of information processing systems, called Data Management Systems (DMS), which has been proposed for vehicle and other process control. These systems are to consist of computers, multiprocessors, multiplexers, dedicated subsystem processors, sensors, and effectors. Provisions for graceful degradation, independent processing on lower levels, and ground support standardization are important characteristics of these information handling and processing systems. The problems and constraints associated with the crew/system interface requirements are explored. A prototype generalized display and command technique is described and discussed in the light of system requirements. M.M.

A71-35208 **The art of selecting aircraft.** M. A. Guinane and Charles Martin (Caledonian-British United Airways, Ltd., London, England). *Shell Aviation News*, no. 396, 1971, p. 2-7.

Use of the concept that long haul international air transport is more economic than any other type of airline operation as a basis for selecting aircraft. Because of the very large amount of money involved, the choice made must be the right one. Each evaluation exercise is broken down into six stages: environment, initial selection, operational study, budgetary study, policy review, and final decision. It occasionally happens that a second or even a third choice must ultimately be selected because of, among other reasons, financing arrangements, better sales appeal, or problems of foreign exchange control. F.R.L.

A71-35526 # **Concorde and C.E.V.: Cooperation between firms and government offices or establishment in the flight test program - Certification flights.** J. Renaudie (Centre d'Essais en Vol, Brétigny-sur-Orge, Essonne, France). *American Institute of Aeronautics and Astronautics, Aircraft Design and Operations Meeting, 3rd, Seattle, Wash., July 12-14, 1971, Paper 71-784.* 14 p. Members, $1.50; nonmembers, $2.00.

The flights which mark the progress made with the Concorde are examined, and aspects of the training of the official pilots are considered. The structure of the French organization for aircraft development certification and the Concorde flight test organization are shown. The functions of the CEV are discussed giving particular attention to their work in connection with the Concorde. A table is presented showing Concorde flying hours up to certification. G.R.

A71-35812 **The administration of a cost/weight tradeoff program.** G. W. Schmiedeke (Douglas Aircraft Co., Long Beach, Calif.). *Society of Aeronautical Weight Engineers, Annual Conference, 30th, Newport Beach, Calif., May 3-5, 1971, Paper 899.* 19 p.

This paper presents the administrative techniques of a cost/weight tradeoff program for a modern jet transport airplane. It introduces the concept and philosophy of using a defined cost/weight value as part of basic design criteria and discusses the full scope of a program to assure its overall application to vehicle design. The role of Management and Weight Engineering in Weight Reduction Programs is discussed in detail. Particular emphasis is placed on the concept of generating and maintaining a large number of weight saving ideas from which Management can select the type and amount of weight reduction that appears desirable for meeting weight guarantees and the competition. Procedures for converting weight saving ideas into actual hardware weight reductions are presented in outline form. Problems associated with assuring weight optimization of subcontract and vendor products are also discussed in detail. (Author)

A71-35924 # **Increasing responsibility for skilled men.** E. Gregory. *Aircraft Engineering*, vol. 43, July 1971, p. 11-13.

Review of the procedures adopted within BEA in formulating and negotiating the second of the two complementary three-year agreements, the first in 1964/1965 and the second in 1968/1969. These procedures reflect current thinking concerning productivity agreements in industry which, it is felt, should be negotiated on a plant basis, and not on an industry-wide one, with the active participation of the staff in order that the deal gain acceptance and fulfill its promise. The development and negotiation of the 1969 agreement are described for each of the various categories of tradesmen and for the maintenance workers and storekeepers. M.V.E.

A71-36348 * # **STOL passenger demand in underdeveloped areas.** Jason C. Yu (Virginia Polytechnic Institute and State University, Blacksburg, Va.). *ASCE, Transportation Engineering Journal*, vol. 97, Aug. 1971, p. 475-490. 13 refs. Grant No. NGR-49-001-012.

The possibility of implementing an air transportation system that would boost the economy of underdeveloped areas (where ground transportation facilities are too costly owing to the rugged terrain) is considered. A travel demand model is employed to predict

the passenger market potential of a preliminary STOL system. The results indicate that passenger service demand for a STOL system will be limited. However, greater demand will obviously come through lower system operating costs and improved terminal accessibility. V.P.

A71-36442 Technology today and tomorrow; Canaveral Council of Technical Societies, Space Congress, 8th, Cocoa Beach, Fla., April 19-23, 1971, Proceedings. Volumes 1 & 2. Edited by N. A. Stein (McDonnell Douglas Astronautics Co., Huntington Beach, Calif.). Cape Canaveral, Canaveral Council of Technical Societies, 1971. Vol. 1, 655 p.; vol. 2, 187 p.

Space communications, space logistics, launch facilities and operations, computer applications, simulation and synthesis, and cryogenics are among the space technology areas covered in the papers presented. Outlooks in advanced space programs, meteorology and weather control progress, management problems and solutions, and maintainability and reliability are reported in contributions pertaining to some of the other space activity aspects considered. M.V.E.

A71-36448 Pan American's planned maintenance control system. Sam Stallone (Pan American World Airways, Inc., Jamaica, N.Y.). In: Technology today and tomorrow; Canaveral Council of Technical Societies, Space Congress, 8th, Cocoa Beach, Fla., April 19-23, 1971, Proceedings. Volume 1. Edited by N. A. Stein. Cape Canaveral, Canaveral Council of Technical Societies, 1971, p. 2-35 to 2-40.

Review of the functions, design, and makeup of a maintenance control system (MCS) based on a modular development plan. MCS is a management information system that incorporates all the control functions of maintenance into an integrated operation. MCS encompasses 12 major functional subsystems supporting scheduling, forecasting, performance evaluation, modifications, and improvement functions at all levels of maintenance management from the production foreman to the vice-president. The objective of MCS is to develop a cost-effective system which links the functional entities of maintenance into a unified management control system and makes use of common data in its operation. M.V.E.

A71-36491 * Reliability's role in key project decisions. Haggai Cohen (NASA, Office of Manned Space Flight, Washington, D.C.). In: Technology today and tomorrow; Canaveral Council of Technical Societies, Space Congress, 8th, Cocoa Beach, Fla., April 19-23, 1971, Proceedings. Volume 2. Edited by N. A. Stein. Cape Canaveral, Canaveral Council of Technical Societies, 1971, p. 13-4 to 13-10.

A brief summary in outline form arrangement is presented of the role played by reliability in the key project decision making process. Reviewed areas include: the establishment of early requirements; preliminary failure mode and effect analyses (FMEA) during conceptual design; design tradeoff studies and participation in baseline meetings; periodic reliability assessment; suspected trouble areas; hardware storage and refurbishment problems; special requirements on experiments; and reliability data bases. M.V.E.

A71-36671 Some air transportation concepts for the future. R. H. Miller (MIT, Cambridge, Mass.). *Aeronautical Journal,* vol. 75, July 1971, p. 431-456. 37 refs. Research supported by the U.S. Department of Transportation.

The growth of air travel for three typical travel markets during the last two decades is examined. It is pointed out that a large mass market exists for general short-haul travel. The potential of service by air not only for airport access but for all travel in the zone served by the long and medium-haul air terminal is examined. A quantitative assessment of the total transport concept is attempted, analyzing the market to be served, the economic factors which will eventually determine the viability of an air system, the environmental factors of noise and pollution, and the important factors of safety, convenience, and dispatch reliability. New vehicle concepts evolve from such a systems study for both short- and long-haul travel. The potential gains in travel time from any point to another on the globe are examined. G.R.

A71-36673 BCAR A8 - Problems and benefits. W. Hampton (Hawker Siddeley Aviation, Ltd., Hatfield, Herts., England). *Aeronautical Journal,* vol. 75, July 1971, p. 465-470.

The philosophy evolved for ensuring high standards and quality levels in the design, development, production, inspection, and product support of a civil aircraft is discussed. Quality responsibilities and control systems of all sections were collected and written down in a single production and quality manual. This made it possible to reveal areas where minor changes were necessary to ensure proper operation of quality control and coordination of all quality functions. V.P.

A71-36676 The civil aircraft market - An examination of the replacement order cycle and the used aircraft market. A. P. Ellison (Queen Mary College, London, England). *Aeronautical Journal,* vol. 75, July 1971, p. 493-504.

The relationship between the age of aircraft, scrapping, and reordering is studied on the basis of a detailed analysis of aircraft histories, the date and age of aircraft scrapping, crashes, and reordering. The analysis also provides information on aircraft sales and their relationship to aircraft deliveries. An estimatable model of used aircraft prices is constructed and is applied to the collected data. The effects of technological changes on airline profits (in the form of the replacement of propeller aircraft by jets) and the ability of airlines to adjust their depreciation policies in order to account for these changes are examined. V.P.

A71-37172 # On the application of modern estimation techniques to air traffic control. Balráj G. Sokkappa (Mitre Corp., Atlantic City, N.J.). *American Institute of Aeronautics and Astronautics, Guidance, Control and Flight Mechanics Conference, Hofstra University, Hempstead, N.Y., Aug. 16-18, 1971, Paper 71-926.* 6 p. 12 refs. Members, $1.50; nonmembers, $2.00.

The application of automatic estimation techniques to track aircraft in real time has its genesis in the development of Air Defense Systems. With the increasing urgency of automation of the control of regular air traffic, the advancement of analytical estimation techniques and the improvements in the speed and capacity of digital computers, increased attention is being paid to the application of sophisticated estimation techniques to track air traffic. However, considering the current requirements on the En Route Air Traffic Control (ATC) Systems the success of these techniques has not been outstanding enough to replace the present simple algorithm. While much attention has been devoted in recent literature to the accuracy attainable with these techniques, very little appears to have been achieved in the area of positive identification in a congested traffic environment. Correct identification is an aspect equally, if not more, important as accuracy in the design of ATC System. The effectiveness of modern estimation techniques from the point of view of computing time and storage as well as accuracy and correct identification in ATC environment is herein discussed. (Author)

A71-37592 **The third London airport - The process of decision.** D. Keith-Lucas (Cranfield Institute of Technology, Cranfield, Beds., England). *Canadian Aeronautics and Space Institute, Royal Aeronautical Society, and American Institute of Aeronautics and Astronautics, Anglo-American Aeronautical Conference, 12th, Calgary, Alberta, Canada, July 7-9, 1971, CASI Paper 72/1.* 18 p. Members, $1.25; nonmembers, $2.00.

Review of the procedures by which the timing and siting of the Third London Airport was determined. The Commission of Inquiry (The Roskill Commission) engaged a research team and a number of outside consultants to gather the facts and carry out a large scale cost benefit analysis. The whole process took 2-1/2 yr and included the identification of 78 possible sites, the reduction to a medium list of 29 sites, and ultimately to a short list of 4 sites. Public hearings were held locally at each of the short listed sites to establish the detailed facts. The completed exercise was not only an investigation into airport siting, but also an experiment in technological decision making in a democratic society. F.R.L.

A71-37593 **Siting of a major airport - The Canadian experience.** D. R. Hemming (Ministry of Transport, Canadian Air Transportation Administration, Ottawa, Canada). *Canadian Aeronautics and Space Institute, Royal Aeronautical Society, and American Institute of Aeronautics and Astronautics, Anglo-American Aeronautical Conference, 12th, Calgary, Alberta, Canada, July 7-9, 1971, CASI Paper 72/2.* 17 p. Members, $1.25; nonmembers, $2.00.

Discussion of the problem of site selection for a major airport, which is a complex task because the site selected is expected to serve more than one objective. The final selection of a site is usually a compromise reached by assigning weights of importance to the various aspects affecting the decision. These are applied by the decision maker, who must consider the facts presented to him by the planner in the framework of political realities. The task of the planner is to narrow down the choice of a few alternatives and to present the facts in such a way that all the important implications of a choice can be assessed at a glance. To illustrate the process examples are drawn from the experience gained during the planning of the Montreal and Toronto area airport systems. F.R.L.

A71-37629 **Some issues concerning the effectiveness of parallel strategies in R & D projects.** William J. Abernathy (Stanford University, Stanford, Calif.). *IEEE Transactions on Engineering Management,* vol. EM-18, Aug. 1971, p. 80-89. 21 refs. Contract No. N 00014-67-A-0111-0010.

Consideration of the strategy of exploring several parallel approaches to a particular question so that the best approach may be chosen. Such a strategy can maintain options while better information for a decision is gained, hedge against an unfortunate outcome, or stimulate competition. This strategy characterizes the framework of decision making in R & D procurement where large amounts of resources are consumed in developing and evaluating competing R & D programs. The rate of learning is a critical parameter which is defined as the rate with which uncertainty is reduced and objectives sharpened with progress in a project. If the rate of learning is rapid, parallel approaches need not be carried far toward completion before a choice among them may be made, and the cost of a strategy will be low. The effect of learning by determining the rate of learning that best explains the pattern of choice and outcome in 21 actual R & D projects is explored. F.R.L.

A71-37630 **Investment model for R & D project evaluation and selection.** Michael A. Cochran (Smith Kline Instruments, Inc., Palo Alto, Calif.), Edmund B. Pyle, III, Leon C. Greene, Harold A. Clymer, and A. Douglas Bender (Smith Kline and French Laboratories, Philadelphia, Pa.). *IEEE Transactions on Engineering Management,* vol. EM-18, Aug. 1971, p. 89-100.

A mathematical model has been developed for the purpose of assisting R & D management in their evaluation and selection responsibilities of potential R & D projects. It is composed of (1) a project evaluation module that utilizes the concept of 'discounted cash flow' to reduce the measures of each project to a single economic index (the expected net present value) and (2) a project selection module that utilizes a linear programming algorithm with 0-1 variables to select the set of projects that maximizes the total expected net present value, while satisfying specified budget constraints. The system, having been implemented through a time-sharing computer service, is presently operational and is being used by management as a tool to assist in the R & D decision-making process. (Author)

A71-37631 * **Some characteristics of technical entrepreneurs.** Edward B. Roberts (MIT, Cambridge, Mass.) and Herbert A. Wainer (Metalphoto Corp., Cleveland, Ohio). *IEEE Transactions on Engineering Management,* vol. EM-18, Aug. 1971, p. 100-109. 15 refs. Research supported by the Massachusetts Institute of Technology; Grants No. NsG-235; No. NsG-496.

Sixty-nine technical entrepreneurs were studied emphasizing the description of several of their characteristics such as family background, education, and motivation. The results indicate that entrepreneurial fathers are more likely to produce entrepreneurial sons. An individual's home environment and attitudes that seem to be embodied in his religious background are likely to have strong influences on his goal orientation, education, and whether or not he becomes an entrepreneur. In addition, those technical entrepreneurs whose fathers had high occupational status were educated sooner and to a higher level than those whose fathers had low occupational status. At the same time it was determined that the technical entrepreneurs who had self-employed fathers usually reached the M.S. degree level, the median education of the entire sample. The predominance of such educational behavior for entrepreneurial sons may be explained by their goal orientation toward a level of education adequate for effectively running a technically based enterprise. Motivational influences on entrepreneurial behavior were not clearly evidenced by analysis of this sample. (Author)

A71-37957 # **Reliability improvement techniques for long life missions.** Charles L. Stumpf (Martin Marietta Corp., Denver, Colo.). *American Astronautical Society, Annual Meeting, 17th, Seattle, Wash., June 28-30, 1971, Paper AAS 71-156.* 19 p. 12 refs.

Four major improvements in hardware reliability are required if unmanned space missions exceeding ten years' duration are to become feasible. First, conditions leading to failures have little relationship to published failure rate data and controls must be established to recognize and prevent these failures. Second, greater and earlier emphasis must be placed on hardware, supplier, and test controls, with particular emphasis on incoming test screens. Third, typical reliability calculations do not ensure the emphasis required to portray alternative degraded modes of operation and ultimate effects of failure on data return. Fourth, a method to optimize recommended modifications to the baseline design to increase the probability of return for the most important data. (Author)

A71-38026 # **Operational planning of airport facilities.** James J. Browne, Rogers Lui (Port of New York Authority, New York, N.Y.), and Ravinder Nanda (New York University, New York, N.Y.). *American Society of Civil Engineers and American Society of Mechanical Engineers, National Transportation Engineering Meeting, Seattle, Wash., July 26-30, 1971, Paper.* 20 p. 5 refs.

Analysis of operating procedures at airports in order to determine effective methods of utilizing the physical facilities. The operational planning of transportation facilities usually strives for a

balance between level of service provided and the cost of operation. In order to show how simulation can be used effectively in operational planning two studies are discussed. A simple application for the analysis of airport parking lot operations is briefly described, in particular the evaluation of the operational feasibility of an automated parking system. The method by which simulation is being used in the planning of the expansion of the International Arrivals Building at Kennedy International Airport is then discussed in detail. F.R.L.

A71-38029 # **A method for examining the costs and benefits of delay reduction with STOL air transportation.** Joan B. Barriage and Stanley P. E. Price (U.S. Department of Transportation, Washington, D.C.). *American Society of Civil Engineers and American Society of Mechanical Engineers, National Transportation Engineering Meeting, Seattle, Wash., July 26-30, 1971, Paper.* 16 p. 11 refs.

The effects of various strategies for investment in STOL fleets are studied on the basis of a heuristic computer model of the decision process. The resulting costs and benefits are computed. The model addresses the following 'what if' kind of question: what if short-haul conventional flights were replaced by STOL flights which do not require long runways. Would the resulting reduction in delays in the conventional system be of sufficient benefit to justify the costs of the STOL fleets and attendant facilities. The decision strategy employed indicates that 10 to 15 city-pair STOL routes are economically justified, and that some of the STOL fleet investments identified have very favorable benefit/cost ratios. V.P.

A71-38221 # **Problems of the interconnection between the seasonal distribution of transportation requirements and the utilization rate of the transport capacity in passenger carriage (Probleme des Zusammenhangs zwischen der jahreszeitlichen Verteilung des Beförderungsbedarfs und der Auslastung der Beförderungskapazität im Fluggastverkehr).** Jochen Grenzdörfer and Anne-Ev Liebetrau. *Technisch-ökonomische Informationen der zivilen Luftfahrt,* vol. 7, no. 7, 1971, p. 309-321. 10 refs. In German.

A table showing the number of aircraft passengers for each month during the period from 1963 to 1968 is presented. The reasons for the pronounced concentration of passenger traffic during the summer months is discussed, giving attention to the traditional habits of people regarding the time for vacations. The data considered are statistically analyzed, and graphs showing the utilization rate of the transport capacity during the various months of one year are obtained as average values for a number of years, taking into consideration conditions in the German Democratic Republic. A number of factors affecting the utilization of the offered transportation capacity are examined, taking into account safety, effective speed of air traffic, the fare, and the frequency of flights for a given route. G.R.

A71-38408 * **Spin-off benefits from space research.** Bradford A. Evans (NASA, Ames Research Center, Moffett Field, Calif.). In: Engineering for the conservation of mankind; Institute of Electrical and Electronics Engineers, Region Six Conference, Sacramento, Calif., May 11-13, 1971, Conference Record.

Edited by M. G. Jerome and Joyce Guthrey. Sacramento, Institute of Electrical and Electronics Engineers, Inc., 1971, p. 6A-1.1 to 6A-1.6. 17 refs.

An outline of the NASA technology utilization program shows how new technology is transferred to the public and private sector and how statements of problems spur the search for solutions. Several examples are presented of spin-off benefits from NASA-originated new technology. Among the special endeavors mentioned, there are the four technology-application and three biomedical-application teams, sponsored by NASA and joined by over 100 cooperating organizations of professional groups and medical research and clinical centers, who are engaged in a problem-stating effort and search for solutions to nonaerospace problems. Of the over 1200 problems accepted by NASA to date, over 226 solutions have been provided. M.V.E.

A71-38409 **A managerial decision system for an airborne infrared fire detection device.** William G. O'Regan (U.S. Forest Service; California, University, Berkeley, Calif.) and Peter Kourtz (Department of Fisheries and Forestry, Ottawa, Canada). In: Engineering for the conservation of mankind; Institute of Electrical and Electronics Engineers, Region Six Conference, Sacramento, Calif., May 11-13, 1971, Conference Record.

Edited by M. G. Jerome and Joyce Guthrey. Sacramento, Institute of Electrical and Electronics Engineers, Inc., 1971, p. 6B-1.1 to 6B-1.5. 6 refs.

Some details are given of the design and construction of a simulator to be used in deriving decision rules for the control of an infrared forest fire detection system. The results of some experiments are given, and some tentative control procedures are suggested. (Author)

A71-38548 # **Planning at several levels in basic research (La planification à plusieurs niveaux en recherche fondamentale).** Gabriel Minder. Eidgenössische Technische Hochschule, Docteur ès Sciences Techniques Thesis, 1970. 108 p. 38 refs. In French.

Description of the medium-term planning process for a large basic research laboratory. The process is based on an information system which uses functional presentations of various activities, and which supplies the elements of analytical models. It is shown that the planning of the research center integrates itself into that of the scientific discipline, and makes it possible to coordinate the unities of research and support. The development of the facilities of the European Council for Nuclear Research is discussed as an example of the process. F.R.L.

A71-39389 **A third London airport.** P. C. Haines (GPS Sciences, Ltd., Farnborough, Hants., England). *(Royal Aeronautical Society, Symposium on Airports and Transport Aircraft - Inter-Relations and Interface Problems, London, England, Dec. 9, 1970.) Aeronautical Journal,* vol. 75, Aug. 1971, p. 531-534.

Discussion of interface problems arising in connection with a third London airport. An airport-to-airport interface is considered giving attention to an inhibition of operations at one airport due to operations at the other because of an in-built interaction. Another interface involves the matching between the respective capacities of the airport and the airspace. Other questions are concerned with the economic use of airspace. Procedures in the airspaces of different countries have to be compatible. G.R.

A71-39390 **The economics of airport operation as affected by transport aircraft design trends.** R. A. Read. *(Royal Aeronautical Society, Symposium on Airports and Transport Aircraft - Inter-Relations and Interface Problems, London, England, Dec. 9, 1970.) Aeronautical Journal,* vol. 75, Aug. 1971, p. 535-538.

Improvements in direct operating costs of an aircraft are often more than offset by increased and additional airport charges. This effect has been most glaringly demonstrated in the increases in runway lengths required for takeoff over the past 15 years. Runway utilization is a critical factor in determining cost and charges. Careful

alignment of parking bays can increase utilization of given areas of concrete. The suitable handling of baggage is also discussed together with problems caused by aircraft noise. G.R.

A71-39391 Airport restrictions as they affect economic airline operation. P. M. Davey (British European Airways Corp., Ruislip, Middx., England). *(Royal Aeronautical Society, Symposium on Airports and Transport Aircraft - Inter-Relations and Interface Problems, London, England, Dec. 9, 1970.) Aeronautical Journal,* vol. 75, Aug. 1971, p. 539, 540.

Discussion of three major areas of concern including congestion, noise, and performance. A graph showing the percentage of BEA departures from London that were delayed for air traffic control reasons is presented. In the main the ATC delays were attributable to problems within the French ATC system. All BEA specifications for new aircraft since 1958 have had a requirement for flyover noise. Additional approaches for reducing noise are considered. G.R.

A71-39395 Objectives and standards for air safety. H. C. Black (Air Registration Board, London, England). *Aeronautical Journal,* vol. 75, Aug. 1971, p. 551-559. 5 refs.

It is tried to forecast accident trends to give guidance on target safety levels for the next decade. It is thought likely that in the future a safety level of one fatal accident per million hours will be achieved by many of the operators. Human factors remain important accident causes, and require close examination when new standards are being written. However, the biggest improvements in this field are likely to come from better piloting aids, and from the wider realization of the importance of management. G.R.

A71-41840 Air freight - A growth industry with problems. Gunnar K. Sletmo (Columbia University, New York, N.Y.). *Columbia Journal of World Business,* vol. 6, Sept.-Oct. 1971, p. 39-46.

General discussion of the air freight industry from the economic point of view. Forecasts suggest that air freight may show almost a tenfold increase in volume between 1968 and 1985. For this to happen, it is considered that air freight will have to break its relationship to air passenger travel. About half of the world's air freight already moves in all-cargo jets. The superior flexibility and high speed of air freight can more than make up for the higher cost in many situations. F.R.L.

A71-41865 The information organizer - A system for symbolic data manipulation. Frank J. Hatfield (Michigan State University, East Lansing, Mich.) and Steven J. Fenves (Illinois, University, Urbana, Ill.). *Computers and Structures,* vol. 1, Aug. 1971, p. 85-102. 9 refs.

A data management system, entitled Information Organizer, based on symbolic manipulation of a model data structure is described. The Information Organizer provides facilities for creating and deleting rows and columns, for sorting and indexing the rows of a table, for addressing columns by label, and for addressing rows either by value or position. The frequency of relatively slow retrievals of secondary-storage segments is minimized by retaining in primary storage previously retrieved segments in anticipation of future needs according to a strategy based on the number and currency of past accesses of each segment. V.P.

A71-42011 # International cooperation - The Concorde experiment. R. Chevalier. *International Astronautical Federation, International Astronautical Congress, 22nd, Brussels, Belgium, Sept. 20-25, 1971, Paper.* 17 p.

The type of organization suitable for programs involving the cooperation of a number of countries in aerospace projects is discussed. A typical example for such an international operation provides the development of the Concorde. The initial projects for an SST were presented during the time from 1960 to 1961. The maiden flight of the prototype took place in 1969 with a delay of about 2 years on the 1962 estimations. The basic organization for the Concorde project is discussed together with aspects of the work share given to the individual partners. G.R.

A71-42022 * # Space transportation report. Dale D. Myers (NASA, Washington, D.C.). *International Astronautical Federation, International Astronautical Congress, 22nd, Brussels, Belgium, Sept. 20-25, 1971, Paper.* 20 p.

It is pointed out that NASA is completing the definition of a two-stage reusable space shuttle system. The plans call for a continuing development of the shuttle in 1972 with the goal of the first manned orbital flight in 1978. In view of budget considerations, various ways of sequencing the development, test, and operations of this system are being studied. The U.S. has restated its interest in international cooperation in the space transportation system program. An exchange of information is currently taking place. It is believed that the space shuttle and its attendant tug offer an unprecedented opportunity to expand and exploit activities in space in such a manner as to improve the lot of man on the earth. G.R.

A71-42066 # The innovative consequences of space technology and the problems of the developing countries. H. K. Afshar (Teheran, University, Teheran, Iran). Teheran, Teheran University Press (Institute of Geophysics, Publication, No. 56), 1971. 419 p. 116 refs. In English and French.

The primary objective of this volume is to list some of the practical benefits of space sciences and space technology with particular emphasis to applications to economic, social, and educational reforms in the developing countries. In connection with this objective an analysis is conducted of the most pressing needs of the various areas, irrespective of their degree of development. The commitments and implications of space technology are examined, and the objectives of space research are considered, giving attention to the various fields which can benefit from applications of space technology. Another aspect of space technology is concerned with the extension of man's knowledge in the exploration of the solar system and with a conceivable contact with extraterrestrial civilizations. G.R.

A71-42102 The correlation method for computer-aided statistical analysis. Giampio Bracchi and Marco Somalvico (Milano, Politecnico, Milan, Italy). *IEEE Transactions on Reliability,* vol. R-20, Aug. 1971, p. 96-101. 10 refs. Research supported by the Consiglio Nazionale delle Ricerche.

Computer-aided statistical analysis of electronic circuits, designed to predict the effects of component-part variability on circuit performance, provides extremely useful assistance in performing a circuit design. The correlation method, a new computer-oriented technique of statistical analysis, provides precise estimates of performance variability, high speed of computation, and the computation of the distribution laws of circuit performance characteristics at a generic time instant. Thus, the quantitative characteristics of reliability can be predicted as functions of time. (Author)

A71-42103 Relcomp - A computer program for calculating system reliability and MTBF. James L. Fleming (Interstate Elec-

A71-43197 # **Repair or throwaway - Graphic screening techniques help supply the answer.** James K. Segar (Lockheed-California Co., Burbank, Calif.). *Logistics Spectrum,* vol. 5, Fall 1971, p. 18-25.

It has been estimated that an overall saving as great as 30% may be realized if each spare part assembly is subjected to an economic analysis of the desirability of repairing the assembly. A technique is presented for making repair-throwaway decisions which minimize costs over life cycle. The technique indicates those cases where a clear-cut decision cannot be made because of imprecise knowledge of costs and failure rates. It is pointed out that the repair-throwaway analysis should be considered for each part as early as possible in the development stage of an aircraft because potential economic savings are greatest then. G.R.

A71-43451 **Large space programs management; Proceedings of the European Colloquium, Paris and Neuilly-sur-Seine, France, February 9-13, 1970.** Colloquium sponsored by the Centre National d'Etudes Spatiales. Edited by Ivan Chvidchenko (Centre National d'Etudes Spatiales, Paris, France). London, Gordon and Breach, Science Publishers, Ltd., 1971. 345 p. In English and French. $19.50.

Large project management techniques, management information procedures, management coordination in international space projects, and satellite project cost estimation methods are among topics covered in contributions concerned with project management theories and practices current in European and American scientific and industrial organizations. Other contributions include papers on the organizational requirements of the technical-administrative management interface, international industrial consortia, the research and development market, contracting procedures, and quality control methods and organization.

M.V.E.

A71-43452 **A management model for a large project.** Homer B. Sewell, Jr. (Boeing International Corp., London, England). In: Large space programs management; Proceedings of the European Colloquium, Paris and Neuilly-sur-Seine, France, February 9-13, 1970. London, Gordon and Breach, Science Publishers, Ltd., 1971, p. 3-29.

Fundamentals of program management are reviewed in the light of a management model for a large project presented in a series of schematic diagrams illustrating the nature and interrelation of the functions involved. The diagram series begins with the program requirements package and includes, among other major elements, the work breakdown structure, the specification tree, a master phasing schedule, program level networks, detail program plans, detail cost estimates, actual cost data, actual time data, and test results. From periodic comparisons of reports containing data on test results, incremental cost achievements, and incremental schedule achievements with technical-performance, cost, and schedule requirements is the determination made whether or not program implementation results in accomplishment of program objectives. M.V.E.

A71-43453 **Program management techniques.** C. C. Martin (McDonnell Douglas Astronautics Co., Santa Monica, Calif.). In: Large space programs management; Proceedings of the European Colloquium, Paris and Neuilly-sur-Seine, France, February 9-13, 1970. London, Gordon and Breach, Science Publishers, Ltd., 1971, p. 31-46.

Prerequisites to successful management of complex programs are reviewed, and some of the techniques used for fulfilling these prerequisites are discussed. Organization for program management, integrated quantitative program planning, and sophisticated control methods to measure progress against plans are shown to be the activities requiring special emphasis. Organization for program management involves delegation of general management authority to a program director, reflected in management directives and establishment of a program oriented data base. Integrated quantitative planning uses system engineering to control technical program specifications and plans. The principal activities of the program director are customer liaison, planning, direction, evaluation, reprogramming, and reporting. Key areas in making program management succeed are personnel selection and training, selective application of program management techniques, and top management support.

M.V.E.

A71-43454 **Is space Parkinsonian - The means of project management (L'espace est-il Parkinsonien - Les moyens de conduite d'un projet).** R. Clauvel (Engins MATRA, Vélizy-Villacoublay, Yvelines, France). In: Large space programs management; Proceedings of the European Colloquium, Paris and Neuilly-sur-Seine, France, February 9-13, 1970. London, Gordon and Breach, Science Publishers, Ltd., 1971, p. 47-66. In French.

The lures and dangers are discussed of oversophistication of project management on theoretical grounds regardless of real practical problems. Space activity in France brought about a both technical and managerial apprenticeship in the management of large projects. While some genuine progress has been accomplished, certain dangers of Parkinsonitis (C. Northcope Parkinson is meant) seem to be looming. A few specific instances are analyzed, and examples of necessary compromises are given. M.V.E.

A71-43455 **Organization of the HEOS project (L'organisation du projet HEOS).** E. Pomp (Messerschmitt-Bölkow-Blohm GmbH, Munich, West Germany). In: Large space programs management; Proceedings of the European Colloquium, Paris and Neuilly-sur-Seine, France, February 9-13, 1970. London, Gordon and Breach, Science Publishers, Ltd., 1971, p. 71-79. In French.

Review of the circumstances underlying the successful accomplishment of the international HEOS 1 project. Its organization was based upon the rationale that only the shortest possible lines of communications assure optimum success. Accordingly, the main contractor's management delegated full authority to the project manager, and all co-contractors and major subcontractors proceeded likewise. This made it possible to reach decisions without undue delays. Project management was organized flexibly enough for being successively modified in accordance with arising program needs. This organization structure proved to be effective because the people involved were able to create and maintain a climate of confidence among all partners and to keep the organization working in this atmosphere. M.V.E.

A71-43456 **Space project organization in a research laboratory (L'organisation des projets spatiaux dans un laboratoire de recherche).** B. Authier (CNRS, Laboratoire d'Astronomie Spatiale, Marseille, France). In: Large space programs management; Proceedings of the European Colloquium, Paris and Neuilly-sur-Seine, France, February 9-13, 1970. London, Gordon and Breach, Science Publishers, Ltd., 1971, p. 81-87. In French.

Review of the organization problems arising from the nature of the tasks of a research laboratory engaged in space astronomy experiments. The laboratory is in charge of the conception, realization, and processing of balloon-, rocket-, and satellite-borne astronomical experiments. The respective roles of the chief scientist, project manager, and technical services are delineated. The types of difficulties sometimes encountered at the interfaces between them are defined and the remedies discussed. M.V.E.

A71-43457 Management information - Oil for the space program machine. R. A. Passman and James R. Polski (General Electric Co., Philadelphia, Pa.). In: Large space programs management; Proceedings of the European Colloquium, Paris and Neuilly-sur-Seine, France, February 9-13, 1970. London, Gordon and Breach, Science Publishers, Ltd., 1971, p. 89-110.

Basic information needs and problems in a project environment are reviewed, and management information is treated in the generic sense, as well as from the standpoint of computerization. The approaches and limitations of techniques successfully used on space projects are described, including the use of the project work breakdown structure, project reports, and meetings. Both the program appraisal and review system and the system of division financial statistics are described and their use over the past seven years is discussed with specific examples of information presented. Two examples of advanced techniques are reviewed and contrasted with past systems. Benefits of both of these computerized systems are discussed and guidelines in management information are cited. M.V.E.

A71-43458 Principles of space project management (Principes de gestion des projets spatiaux). H. Billig (Gesellschaft für Weltraumforschung mbH, Bad Godesberg, West Germany). In: Large space programs management; Proceedings of the European Colloquium, Paris and Neuilly-sur-Seine, France, February 9-13, 1970. London, Gordon and Breach, Science Publishers, Ltd., 1971, p. 111-126. 5 refs. In French.

A summary is given of the essential principles of modern management as they apply to space projects, in particular. The peculiar features of space project tasks are reviewed, and their implications for project management under European conditions are discussed in terms of management requirements entailed. The latter include: (1) definition of objectives at all levels for each task; (2) adequate motivation for the mobilization of all the resources of each individual participant; and (3) procurement and organization of management means providing availability of all modern possibilities. The management example of a satellite project is presented. M.V.E.

A71-43459 Cost estimation of satellite projects. G. Dondi (ESRO, European Space Operations Centre, Darmstadt, West Germany). In: Large space programs management; Proceedings of the European Colloquium, Paris and Neuilly-sur-Seine, France, February 9-13, 1970. London, Gordon and Breach, Science Publishers, Ltd., 1971, p. 127-157. 10 refs.

Evaluation of the merits of various cost formulae for estimating the costs of satellite projects. An attempt is made to classify and characterize different types of cost estimation procedures in order to set up an adequate frame of reference in the use of cost formulae derived from past statistical data for determining the costs of future space projects. Correlations of nomenclatures and symbols used in various cost formulae are determined by comparing their cost estimate yields. The validity of these formulae in estimating the cost of present ESRO satellite projects is assessed, and a critical analysis of the limitations of the formulae is performed. M.V.E.

A71-43460 Problems of industrial project management: Program director - Project management contractor (Problèmes de maitrise d'oeuvre industrielle: Maitre d'ouvrage - Maitre d'oeuvre). C. Bigot and C. Chassignet (Centre National d'Etudes Spatiales, Brétigny-sur-Orge, Essonne, France). In: Large space programs management; Proceedings of the European Colloquium, Paris and Neuilly-sur-Seine, France, February 9-13, 1970. London, Gordon and Breach, Science Publishers, Ltd., 1971, p. 161-168. In French.

Definitions are provided of the functions and responsibilities of a program director, project management contractor, subcontractor, and manufacturer in the implementation of European space projects. A description of the tasks involved in the realization of a satellite launching program is used as a frame of reference for the various contributive roles defined. M.V.E.

A71-43461 The executive work team of an industrial project-management contractor in a major space program (L'equipe de projet de l'industriel maître d'oeuvre d'un grand programme spatial). C. Attali (Société Nationale Industrielle Aérospatiale, Paris, France). In: Large space programs management; Proceedings of the European Colloquium, Paris and Neuilly-sur-Seine, France, February 9-13, 1970. London, Gordon and Breach, Science Publishers, Ltd., 1971, p. 169-187. In French.

The tasks of the project-management work team throughout the various program phases are reviewed in the light of the responsibilities assumed by the prime industrial contractor. The prerequisites to a successful accomplishment of these tasks are shown to be: (1) a select, coherent, closely knit management team led by a project manager selected with utmost care; (2) use of the most appropriate management methods; and (3) the creation and maintenance of a sound client-contractor relationship in a climate of total confidence and cooperation. Various practical means are discussed for the fulfillment of these prerequisites. M.V.E.

A71-43462 Organization of a program by a supervisory organization (Organisation d'un programme chez le maitre d'oeuvre). J. Laplume (Société d'Etudes Techniques et d'Entreprises Générales, Le Plessis-Robinson, Hauts-de-Seine, France). In: Large space programs management; Proceedings of the European Colloquium, Paris and Neuilly-sur-Seine, France, February 9-13, 1970. London, Gordon and Breach, Science Publishers, Ltd., 1971, p. 189-202; Discussion, p. 203-206. In French.

Discussion of the management of nuclear test programs, the many aspects of which are similar to the management of a space project. Particular attention is given to the experience gained in the field of nuclear trials. Problems of reliability, of delays, and of cost are discussed. F.R.L.

A71-43463 The consortiums (Les consortiums). J. Le Peltier (ESRO, Neuilly-sur-Seine, Hauts-de-Seine, France). In: Large space programs management; Proceedings of the European Colloquium, Paris and Neuilly-sur-Seine, France, February 9-13, 1970. London, Gordon and Breach, Science Publishers, Ltd., 1971, p. 207-221. In French.

Examination of the problems of the European Space Research Organization (ESRO) with reference to relations with industrial firms from member states and the different possible solutions. It was considered that the best solution was to form multinational groups of firms, or consortia. The present situation is reviewed, and new problems are discussed. The procedure envisaged for allocation of satellite studies and development programs, and future programs of ESRO are outlined. F.R.L.

A71-43464 Evolution of the foundation of public markets from the juridical to the economic (Evolution du fondement des marchés publics du juridique à l'économique). J. Monin (Fédération Nationale des Industries Electroniques, Paris, France). In: Large space programs management; Proceedings of the European Colloquium, Paris and Neuilly-sur-Seine, France, February 9-13, 1970. London, Gordon and Breach, Science Publishers, Ltd., 1971, p. 225-236. In French.

Attempt to show the increasing extent to which the economic

impact of the policy governing public procurement is being taken into account. The classical concept of the 19th century, according to which a public contract is an administrative act governed by public domestic law based on the disparity of the interests concerned, is reviewed. It is considered that recent evolution can be neither general nor complete. It is impeded by the continued effects of old legal concepts and, consequently, the obligations faced by contractors dealing with the government and public agencies are often both incompatible and contradictory. F.R.L.

A71-43465 Industrial ownership in the research and development markets (La propriété industrielle dans les marchés d'étude et de développement). F. Delsart (Union Syndicale des Industries Aéronautiques et Spatiales, Paris, France). In: Large space programs management; Proceedings of the European Colloquium, Paris and Neuilly-sur-Seine, France, February 9-13, 1970. London, Gordon and Breach, Science Publishers, Ltd., 1971, p. 237-246. In French.

Examination of the compatibility of the objectives of customer organizations and supplier industrialists, as expressed in market patent rights clauses. It is considered that the answer is affirmative, and principles are defined which, as regards patents, diffusion of knowledge, and copyright, should make possible the best possible efficiency for credits assigned to studies, while ensuring reciprocal respect of the rights of each party. F.R.L.

A71-43466 ELDO contracts procedure - Present situation and future aspects. W. Brado (Organisation Européenne pour la Mise au Point et la Construction de Lanceurs d'Engins Spatiaux, Paris, France). In: Large space programs management; Proceedings of the European Colloquium, Paris and Neuilly-sur-Seine, France, February 9-13, 1970. London, Gordon and Breach, Science Publishers, Ltd., 1971, p. 247-254.

The possibilities and limitations of project management are demonstrated by means of contractual procedures, using as an example the contractual system of a major European project in the field of space research. Experience in ELDO has shown that contractual procedures are a decisive factor in the successful and most economic implementation of a technical program. Direct placing of contracts by the project management authority is to be preferred to indirect, decentralized contract management, since it offers the only way of taking immediate advantage of the benefits accruing from the application of advanced contractual systems. G.R.

A71-43467 The incentive contract (Le contrat avec intéressement). G. P. van Reeth (ESRO, European Space Research and Technology Centre, Noordwijk, Netherlands). In: Large space programs management; Proceedings of the European Colloquium, Paris and Neuilly-sur-Seine, France, February 9-13, 1970. London, Gordon and Breach, Science Publishers, Ltd., 1971, p. 255-264. In French.

Discussion of incentive contracts, the technique of which consists mainly of determining the profit made by the contractor in proportion to his achievement in cost, schedule, and technical performance. Some objections to incentive contracts are that overruns are not entirely avoided, and they are difficult to administer. The applicability of each type of contract should be defined in accordance with the nature of the project. In particular, the problem of unanticipated unknowns emerging during the development should be the determining factor in deciding type of contract. F.R.L.

A71-43468 Contractual aspects of quality (Aspects contractuels de la qualité). J. Gruau (Centre National d'Etudes Spatiales, Brétigny-sur-Orge, Essonne, France). In: Large space programs management; Proceedings of the European Colloquium, Paris and Neuilly-sur-Seine, France, February 9-13, 1970. London, Gordon and Breach, Science Publishers, Ltd., 1971, p. 266-271. In French.

Discussion of some of the problems of quality assurance provisions posed by space hardware supply contracts. These provisions are shown to transcend the usual responsibilities of 'industrial inspection services,' since the quality of space hardware is rooted in the design stage. M.V.E.

A71-43469 On the search for quality (A la recherche de la qualité). M.-Y. Boishardy (Société Nationale Industrielle Aérospatiale, Paris, France). In: Large space programs management; Proceedings of the European Colloquium, Paris and Neuilly-sur-Seine, France, February 9-13, 1970. London, Gordon and Breach, Science Publishers, Ltd., 1971, p. 273-284. In French.

Analysis of the important factors in quality control, which were learned in the course of ten years' work on groups concerned with the Diamant A satellite launching vehicle and with French military programs. U.S. methods of evaluating quality and reliability are discussed, and it is emphasized that positive efforts must be made for the successful management of a project. Each individual must master his own possibilities and be conscious of his own responsibilities. The relationships to be established with the client are examined. F.R.L.

A71-43497 * NHB 5300.4 (1A) reliability program provisions for aeronautical and space system contractors. Leslie W. Ball (NASA, Marshall Space Flight Center, Huntsville, Ala.). *Journal of Quality Technology*, vol. 3, Oct. 1971, p. 179-183.

NHB 5300.4 (1A) provides an excellent demonstration of the professional maturity that has been achieved by the reliability engineering provision. It provides a highly effective guide to any contractor reliability engineer in the writing of a reliability program plan. In addition, it provides the reliability engineer with an excellent set of criteria for his contributions to the basic function program plans, that is, for his inputs into the program management, system engineering, manufacturing and facilities, and support and use program plans. G.R.

A71-44169 R & D in Soviet aviation. Arthur J. Alexander (RAND Corp., Santa Monica, Calif.). *Instruments and Control Systems*, vol. 44, Oct. 1971, p. 37-40.

Research institutes, design bureaus, and manufacturing plants are administratively autonomous organizations coordinated under the Ministry of Aviation. A prominent feature of the Soviet aircraft industry is the absence of small contractors. Emphasis on the use of handbooks permits the research institutes to control aerodynamic structures and manufacturing techniques. A proposal for a new aircraft is submitted to several independent design bureaus. The building of the prototype is discussed together with the manufacture of the product, and approaches responsible for technological innovations. G.R.

A71-44364 The art and science of selecting and solving research and development problems. R. C. Parker (Ferodo, Ltd., Stockport, Ches., England). *Institution of Mechanical Engineers, Proceedings*, vol. 185, no. 64, 1970-1971, p. 879-893. 59 refs.

Description of strategies and tactics which have been found to aid the solution of industrial research and development problems in terms of products and elements. It is emphasized that laboratories have repeatedly selected and solved the same problems. Progress has spiralled upward and successive solutions have come through added

refinement, through experience, or through new knowledge or new techniques. Mention is made of the element of chance in problem selection and solving. F.R.L.

A71-44593 # **Managing technology transfer.** Thomas C. Varley (U.S. Navy, Office of Naval Research, Arlington, Va.). *American Institute of Aeronautics and Astronautics, Annual Meeting and Technical Display, 8th, Washington, D.C., Oct. 25-28, 1971, Paper 71-1008.* 5 p. 7 refs. Members, $1.50; nonmembers, $2.00.

This paper discusses some basic questions concerning the management of technology transfer. It describes three major points that are necessary before successful transfer can be accomplished. Distinction will be made between active and passive pursuit of technology transfer, the catalyst and his role, and vertical and horizontal technology transfer. (Author)

A71-44599 # **Science in space: How pure - How pragmatic.** Carl L. Kober (Martin Marietta Corp., Denver, Colo.). *American Institute of Aeronautics and Astronautics, Annual Meeting and Technical Display, 8th, Washington, D.C., Oct. 25-28, 1971, Paper 71-1021.* 6 p. 17 refs. Members, $1.50; nonmembers, $2.00.

Review of the reorientation problems that, with the end of the Apollo program, NASA is now confronted with. The problems of this science-to-applications transition are manifold: pure science in space is better defined than the new pragmatic applications. Other government agencies, such as the Department of the Interior, Department of State, Department of Agriculture, and Department of Commerce, are beginning to play a program role. Pragmatism in space science ranges from communications, air traffic control, education, to earth resources and meteorology. This creates for science in space an interagency problem. The problems of planning the next ten years of science in space under the aspects of proliferation and interaction of various government agencies raise questions on budget, cognizance, and program management. The policy problems to be resolved to arrive at a long-range space science program are defined. M.V.E.

A71-44600 # **Commercial air transportation - What's the prognosis.** *American Institute of Aeronautics and Astronautics, Annual Meeting and Technical Display, 8th, Washington, D.C., Oct. 25-28, 1971, Paper 71-1022.* 18 p. Members, $1.50; nonmembers, $2.00.

Current trends in the industry of commercial air transportation are reviewed, and the requirements of optimal planning for the future are examined. Key issues discussed include airline economic viability, industry regulation, public service, and environmental compatibility. Options and considerations are presented rather than 'pat' solutions, for optimum solutions to many of the problems are clearly not evident. Only joint industry/government dialogues are likely to start an effective search for sound principles and 'good' objectives. M.V.E.

A71-44601 # **The aerospace professional - His present, his future, and his impact on the nation.** Eli Brookner (Raytheon Co., Bedford, Mass.) and Jerry Grey (American Institute of Aeronautics and Astronautics, Inc., New York, N.Y.). *American Institute of Aeronautics and Astronautics, Annual Meeting and Technical Display, 8th, Washington, D.C., Oct. 25-28, 1971, Paper 71-1023.* 12 p. 20 refs. Members, $1.50; nonmembers, $2.00.

Discussion of the present unemployment situation in the aerospace industry and review of future development prospects. After showing the decline in employment and expenditures since the 1968 peak period to amount to 294,000 scientists and engineers (including all DOD/NASA contractors and 1971-72 graduates) and $7.6 billion, respectively, the difficulties that confront any attempt at realistic predictions are pointed out. A brief review of the possibilities for improving the lot of the aerospace engineer/scientist includes self-help efforts, conversion to nonaerospace fields, active lobbying for aerospace programs, establishment of R & D incentives, unionization, and establishment of 'portable' - i.e., transferable from one employer to another when changing jobs - pensions. Future engineering and science college enrollments, the antitechnology movement, and the effect of aerospace unemployment on the nation's future are some of the other topics briefly considered. M.V.E.

STAR ENTRIES

N71-10030# Programmes Analysis Unit, Didcot (England).
TECHNOLOGICAL FORECASTING AS A MANAGEMENT TOOL
P. M. S. Jones Oct. 1969 32 p refs Presented at Lecture to Polytechnic School of Management Studies Course, 19–23 May 1969
(PAU-M-10) Copyright. Avail: NTIS; HMSO 5s; BIS $1.00

Technological forecasting, which is defined as the prediction of the levels of technology which will be achieved or needed in a future social/economic environment, is discussed as a management tool. The objectives of technological forecasts from the industrial and national standpoint are to identify: (1) demand patterns and technical improvements in existing products, (2) new or greatly improved products, (3) future developments in technological fields which affect the viability of existing or future business, (4) military or economic threats to the nation, and (5) changes in society that result from innovations. Forecasting for research and development management, and the techniques of forecasting are also discussed.
F.O.S.

N71-10114# Federal Aviation Administration, Washington, D.C. Systems Maintenance Service.
REPORT ON SYSTEMS MAINTENANCE PROGRAM EVALUATION CONDUCTED IN THE EASTERN REGION, 22 JULY–15 AUGUST 1969
Oct. 1969 42 p ref
Avail: NTIS

Significant strengths and weaknesses identified in the SMS evaluation of the Eastern Region maintenance program are summarized. Findings are based on visits to sectors and Airway Facilities Branches (AFB) in the Region's four areas (Washington, Cleveland, Boston and New York), to the Airway Facilities Division (AFD) and other regional headquarters elements, and on study of pertinent documents. It is concluded that budgetary limitations and other factors have affected SM program management and execution.
Author

N71-10247# Colorado State Univ., Fort Collins.
TRANSPORTATION RESEARCH NEEDS RELATED TO CIVIL ENGINEERING
Robert F. Baker Jun. 1970 288 p refs Prepared in cooperation with Am. Soc. of Civil Engr.
(PB-193388; CER69-70C WT41) Avail: NTIS CSCL 15E

The civil engineering research needs in the field of transportation are reported. A program is drawn looking to the future needs of the profession for the type of engineering information, data, and findings best developed through purposeful research. The present and immediate future needs for research in the civil engineering aspects of transportation are discussed. Needed research in associated fields is indicated but not detailed. Transportation is considered as a system made up of a grouping of parts, or sub-systems, of social and economic programs. The role of transportation in society, and the interest that the civil engineer has in transportation are established. A program of research is presented in considerable detail with estimates of the level of funding considered to be necessary if the profession is to improve and enlarge its capabilities to meet the future needs for transportation of the society. Many subjects, such as, soil mechanics and foundations, structures, and environmental considerations, which are vital to overall development of a transportation system were treated lightly.
Author

N71-10292# General Accounting Office, Washington, D.C.
REVIEW OF THE PROCEDURES AND PRACTICES FOR CONTROL OF MATERIALS UNDER THE APOLLO PROGRAM. NATIONAL AERONAUTICS AND SPACE ADMINISTRATION (B-158390) Comptroller General's Report to the Congress
Elmer B. Staats 8 Nov. 1968 39 p refs
Avail: Issuing Activity

The management of materials acquired by a prime contractor, North American Rockwell Corporation (NARC), for performance of contracts with NASA under the Apollo program was reviewed. NARC's accountability of materials during 1967 and early 1968 was covered as well as earlier situations relating to materials management. The effectiveness was examined of NASA's administration of the materials management aspects of the contracts and NARC's control over and disposition of contract materials. The review covered selected high-cost items on hand or in process of being procured for the Apollo program and was performed at the facilities of NARC at Downey and Seal Beach, California; NASA Headquarters, Washington, D.C.; the Marshall Space Flight Center, Huntsville, Alabama; and the Manned Spacecraft Center, Houston, Texas. The review did not relate to the contractor's overall property management responsibilities, such as those relating to the accountability and control over special tooling, test equipment, and other equipment acquired for government use in performance of the contracts under the Apollo Program.
Author

N71-10816# Congress. House. Committee on Interstate and Foreign Commerce.
CIVIL AERONAUTICS BOARD AIR MAIL RATE AUTHORITY
Washington GPO 1970 71 p refs Hearings on H.R. 16879 before Comm. on Interstate and Foreign Com., 91st Congr., 2d Sess., 14–15 Apr. 1970 *Its* Serial No. 91-52
Avail: Subcomm. on Transportation and Aeron.

Discussed is a provision authorizing the postal authorities to contract with certified air carriers for the carriage of airmail by the filing of tariffs, and the resulting changes to the Civil Aeronautics Board air mail rate authority.
G.G.

N71-10817# Congress. House. Committee on Science and Astronautics.
TOWARD A SCIENCE POLICY FOR THE UNITED STATES
Washington GPO 1970 121 p refs Rept. presented to Comm. on Sci. and Astronaut., 91st Congr., 2d Sess., 15 Oct. 1970 *Its* Serial S
Avail: Subcomm. on Sci., Res., and Develop.

The Subcommittee on Science, Research, and Development formulates recommendations for a national science policy and corresponding budgeting. The comprehensive effort outlines overall goals, objectives, and priorities, and analyzes the relationship between science and the current state of the nation. It is concluded that the continuing development of science and technology at an optimum rate is vital and can be best stated and maintained by public law in the operations of every department or agency of the U.S. Government which utilizes science and technology in its mission.
G.G.

N71-10977# National Science Foundation, Washington, D.C.
RESEARCH AND DEVELOPMENT IN STATE GOVERNMENT

AGENCIES Fiscal Years 1967 and 1968
May 1970 103 p refs
(NSF-70-22) Avail: SOD $1.00

Increased emphasis has been given to the role of State governments in solving the many problems of modern society—cultural, economic, social, and environmental. The current report shows a great increase in State agency expenditures for research and development between 1964 and 1968, and reflects the interest of many State agencies in new approaches, techniques, and methods of coping with specific problems such as air and water pollution, mental disease and retardation, educational deficiencies, crime, and many other problems. Author

N71-11023# Stanford Univ., Calif. Dept. of Aeronautics and Astronautics.
OPTIMIZATION TECHNIQUES IN AIRCRAFT CONFIGURATION DESIGN
Brent Silver and Holt Ashley Jun. 1970 59 p refs
(Contract F44620-68-C-0036)
(AD-711410; SUDAAR-406; AFOSR-70-2361TR) Avail: NTIS CSCL 1/3

The application of optimization techniques to aircraft configuration design is discussed. Advantages and disadvantages of automated search methods are compared with those of parametric analysis methods. The formulation of the design problem for direct search methods using a normalization procedure is developed. Various direct methods are briefly described. Operational results using several of these methods are reported for aircraft configuration design problems. Gradient methods are found to give disappointing results when compared with certain non-gradient methods. Reasons are suggested for this behavior. The future promise of man-computer interactive design is briefly described. Author (TAB)

N71-11034# Committee on Government Operations (U.S. Senate).
TFX CONTRACT INVESTIGATION, SECOND SERIES, PART 2
Washington GPO 1970 220 p refs Hearings before Comm. on Govt. Operations, 91st Congr., 2d Sess., 25–26 Mar., 7, 9, and 14 Apr. 1970
Avail: Permanent Subcomm. on Invest.

Congressional testimony is reported on investigation of the TFX aircraft contract. Testimony is given on the primary mission of the aircraft, the contract schedule, proposed changes in the design, and difficulties encountered during development and testing. R.B.

N71-11198 Naval Personnel and Training Research Lab., San Diego, Calif.
TASK ANALYSIS REDUCTION TECHNIQUE (TART) FOR THE QUANTIFICATION OF HUMAN PERFORMANCE
Robert H. Ellis Sep. 1970 37 p refs
(AD-711807; SRM-71-7) Avail: NTIS CSCL 5/9

A Task Analysis Reduction Technique (TART) for collecting human factors information was developed and applied to the anti-submarine warfare tactical data system. TART is a specific procedure for analyzing the man/machine interface which allows the researcher to analyze sequential properties of the man/machine interaction. The technique is based on an analysis of the interface at a task level and uses closed circuit television and video tape recording apparatus. A trial application was performed using four air detector/trackers who were presented a one-hour air scenario in the anti-submarine warfare tactical data system. The results section presents various breakdowns of the TART data and indicate that TART can provide valuable insight into man/machine design and training effectiveness decisions. Author (TAB)

N71-11323# Planning Research Corp., McLean, Va.
ATOMATIC DATA PROCESSING RESOURCE ESTIMATING PROCEDURES (ADPREP) Final Report
Silvio Pelosi, Bill Parham, John Berterman, Arlen Feldman Aug. 1970 110 p refs
(Contract DAHC15-69-C-0343)
(AD-711117; PRC-R-1527) Avail: NTIS CSCL 9/2

The objectives of the project were to determine the feasibility of collecting US Army experience data relative to the development, operation, and maintenance of computer application programs; and having done so, to collect and analyze data for developing extimating relationships. The projects report is organized in four volumes. The first volume summarizes the history of the project, presents the findings, conclusions and recommendations, and describes the results and methodology. The other three volumes contain the systems descriptions, the resource estimating procedures and the data collection plan. Author (TAB)

N71-11628# Rolls-Royce, Ltd., Bristol (England). Bristol Engine Div.
THE EFFECT OF VALVE ENGINEERING ON AERO-ENGINE DESIGN AND MANUFACTURE
D. G. Iles *In* AGARD Advanced Technol. for Production of Aerospace Eng. Sep. 1970 13 p
Avail: NTIS

A description of the salient points in the value engineering technique is given and its aims and objectives are outlined. Unnecessary costs are identified and the process for their elimination through the job plan is described. The three phases of value engineering in practice are discussed and results of value engineering applications are demonstrated by case studies and a description how the solutions were developed. The value engineering appreciation training scheme adopted by Rolls Royce and how it achieved success is also depicted. Author

N71-11892# RAND Corp., Santa Monica, Calif.
PROGRAM BUDGETING: ITS UNDERLYING SYSTEMS CONCEPTS AND INTERNATIONAL DISSEMINATION
David Novick and Daniel J. Alesch Sep. 1970 28 p refs Submitted for publication
(AD-711903; P-4462) Avail: NTIS CSCL 5/1

In the document, program budgeting has been viewed as an aid to government in its role of guiding and managing social, economic and environmental systems within governments jurisdiction. The origins of the planning-programming-budgeting system have been traced and its development in the United States and world-wide has been described. Concepts from general systems theory and from cybernetics are rooted in the approaches which characterize program budgeting. Implementation in numerous countries throughout the world illustrates the flexibility of the system. Author (TAB)

N71-12237 Northwestern Univ., Evanston, Ill.
A FEASIBILITY STUDY OF V/STOL AIR TRANSPORTATION IN THE APPALACHIAN REGION: A CONCEPTUAL FRAMEWORK AND EXAMPLE ANALYSIS
Everett Charlie Carter (Ph.D. Thesis) 1969 293 p
Avail: Univ. Microfilms: HC $13.30/Microfilm $3.80 Order No. 70-23

The feasibility of a major transportation innovation in a region was studied. The attempt was to study the factors involved in an air transportation system and to develop an approach to the systems study of a regional air transportation system; and to use the methodology developed to study the feasibility of introducing

vertical or short take off and landing (V/STOL) air transport in the Appalachian region. By developing a decision diagram for transportation in the Appalachian Region, it was determined that the objective of this research in studying the feasibility of V/STOL was within the regional goals of improving the economy of the region. In order to keep the study manageable, West Virginia was chosen as representative of the region. A study of existing and projected technology led to the selection of short take-off and landing (STOL) vehicles for detailed study. Two types of systems were formulated as realistic for West Virginia; they both included a jet airport at Charleston and feeder airports at other cities. The first type of system would have the feeder airports served by STOL aircraft and the second type would use conventional take-off and landing (CTOL) aircraft to serve the feeder airports. Dissert. Abstr.

N71-12817# Case Western Reserve Univ., Cleveland, Ohio. Dept. of Operations Research.
CAPITAL BUDGETING-PROJECT SELECTION BY MATHEMATICAL PROGRAMMING: AN ANNOTATED BIBLIOGRAPHY
Roy B. Larson Jan. 1970 170 p refs
(TM-173) Avail: Issuing Activity

A comprehensive survey of literature relevant to the application of mathematical programming methods in corporate planning is presented. Continual reference is made to three subjects: (1) the Lorie-Savage problem; (2) the Hirshleifer paradox; and (3) the Markowitz criteria. D.L.G.

N71-13232# RAND Corp., Santa Monica, Calif.
WHAT IF UTILITY FUNCTIONS DO NOT EXIST?
Fred S. Roberts Sep. 1970 35 p refs
Contract DAHC15-67-C-0141; ARPA Order 189-1)
AD-712762; R-528-ARPA) Avail: NTIS CSCL 12/2

The document discusses alternatives to the strict decisionmaking goal of ranking all alternatives or, equivalently, obtaining a utility function. For many military problems, the best information available is the combined judgements of experts. Often, however, the preferences of decisionmakers are too inconsistent or ambiguous to permit a complete ranking of alternatives or a utility function. Optional methods for dealing with such a situation include finding a procedure through which preferences can be modified to obtain a utility function; using the utility assignment that best approximates a utility function; or modifying the demands on utility functions. The study emphasizes the third alternative, and describes it in terms of techniques from the theory of measurement, recently developed by behavioral scientists, that facilitate decisionmaking where no utility functions exist. TAB

N71-13524# RAND Corp., Santa Monica, Calif.
A TWISTED TURNPIKE THEOREM
Emmett B. Keeler Sep. 1970 20 p refs
(AD-712696; P-4450) Avail: NTIS CSCL 5/3

Weather, conflict, and sectorally uneven technical progress may cause production possibilities to vary with time. This paper generalizes the Morishima turnpike theorem to bounded, but not constant, normalized production possibilities. The variation in the set of efficient paths and prices still becomes small for long programs. However, the turnpike may be twisted, and also difficult to compute. Author (TAB)

N71-13621# Congress. House. Committee on Science and Astronautics.
THE NATIONAL SPACE PROGRAM: PRESENT AND FUTURE A COMPILATION OF PAPERS PREPARED FOR THE SUBCOMMITTEE ON NASA OVERSIGHT
Washington GPO 1970 250 p refs Presented to the Comm. on Sci. and Astronaut., 91st Congr., 2d Sess., 10 Dec. 1970 /ts Serial U
Avail: SOD $1.00

The Subcommittee on NASA Oversight of the House Committee on Science and Astronautics scheduled public hearings for September and October 1970. The subcommittee proposed to explore what should be the objectives of our national space program during the next decade, and the level of funding that would be needed to support a program calculated to achieve those objectives. Distinguished representatives from Government, the aerospace industry, and the academic community were invited to participate. Due to the press of legislative business, and the uncertain status of the NASA appropriation measure for fiscal year 1971 because of the President's veto, the hearings were canceled. Nevertheless, the views of the scheduled witnesses were considered to be of such interest and significance under present circumstances that they were asked to submit their statements for review and publication. Author

N71-14067# Joint Publications Research Service, Washington, D.C.
METHODOLOGICAL PROBLEMS OF LONG-RANGE FORECASTING
S. Kheynman 23 Nov. 1970 17 p Transl. into ENGLISH from Vopr. Ekonomiki (Moscow), no. 10, 1970 p 15-28
(JPRS-51841) Avail: NTIS

Long-term forecasting of economic development and the models reflecting it are discussed with respect to the rates and scales of economic growth, and also the structural changes which are the most important characteristics of economic processes. Criteria are given for defining the goals of development, their subordination, and the methods of achieving the given goals in a Socialist society. A combination of extrapolative and normative methods in long-range forecasting of scientific and technological progress is cited as the most feasible methodology. R.B.

N71-14092*# National Aeronautics and Space Administration, Washington, D.C.
RESEARCH AND DEVELOPMENT DATA POLICIES OF CIVILIAN GOVERNMENT AGENCIES
Leonard Rawicz [1970] 18 p refs Presented to 3d Ann. Briefing Conf. on Govt. Procurement, Huntsville, Ala., 15 Oct. 1970
(NASA-TM-X-66509) Avail: NTIS CSCL 05A

The differences in policies of various civilian agencies are discussed with respect to the rights of contractor, agency, and public to the data. The term data is equated with the DOD definition of technical data, and includes computer programs and information data bases. The policies considered are those of the following agencies: NASA; Atomic Energy Commission; National Science Foundation; Department of Health, Education, and Welfare; Department of Agriculture; Department of Transportation; Office of Saline Water, Department of Interior; and Housing and Urban Development. It is concluded that the data policies are similar in definitions with regard to the copyright area, but there are differences in policies based on a lack of guidelines or communications among the agencies. It is recommended that effort be expended to achieve somewhat more consistency in government policies, as was done in 1963 with respect to patent policies. N.E.N.

N71-14353# Naval Postgraduate School, Monterey, Calif.
A MODEL OF THE PLANNING, PROGRAMMING, AND

BUDGETING PROBLEM
Robert Stephen Brent (M.S. Thesis) Jun. 1970 63 p refs
(AD-712455) Avail: NTIS CSCL 5/1

A model of the planning, programming, and budgeting problem is formulated. The variables of the model are resources, elements, characteristics, benefits (measures of effectiveness), and costs. The nature of the PPB problem requires that the model incorporate multiple measures of benefit and cost. To characterize efficient choices in the PPB context decision rules which are necessary and sufficient for efficiency are derived. Discounting of benefits over time is discussed. Sensitivity analysis of the model is performed. Decentralization possibilities in the model are explored. Author (TAB)

N71-14361# RAND Corp., Santa Monica, Calif.
A METHODOLOGY FOR COST FACTOR COMPARISON AND PREDICTION
Alvin J. Harman and Susan Henrichsen Aug. 1970 80 p refs
(Contract DAHC15-67-C-0141; ARPA Order 189-1)
(AD-712457; RM-6269-ARPA) Avail: NTIS CSCL 14/1

An improved technique is reported for analyzing the cost experience of weapon system procurements. Unlike earlier analyses, this one accounts for performance requirements, program duration, degree of technological advance, level of effort, earliness of estimates, and subsequent program changes, as well as the more usual ratio of estimated to actual costs (cost factors). Fifteen weapons for which enough information was available were analyzed and the results were compared with 1950s aircraft and missile experience. Based on an assessment of the technological advance and length of time for development of a future system, the actual cost and range of uncertainty can be predicted using this mode. TAB

N71-14375# Rochester Univ., N.Y. Management Research Center.
COMPARATIVE SURVEYS OF MANAGERIAL ATTITUDES AND BEHAVIOR
Gerald V. Barrett and Bernard M. Bass 1 Aug. 1970 55 p refs Presented at Comp. Management Workshop, New York, 30 – 31 May 1970
(Contract N00014-67-A-0398-0002)
(AD-712481; TR-36) Avail: NTIS CSCL 5/1

A review of cross-national managerial attitudes and behaviors was organized around eight themes. The eight subject areas were: superior-subordinate relationships; managerial needs or motivation; interpersonal processes; organizational goals; perceptions of equity; decision-making under uncertainty; managerial values; relationship between managerial attitudes and other organizational and environmental variables. It was concluded that while the comparative study of managerial behavior is extremely difficult because the usual research problems are magnified many times. Despite methodological problems, considerable advances have been made in a relatively short time. Several substantive research directions were proposed. Author (TAB)

N71-14677# Forsvarets Teletekniska Lab., Stockholm (Sweden).
REPAIR AND MAINTENANCE [REPARATION OCH UNDERHALL]
H. Ebenfelt May 1969 12 p refs In SWEDISH
(FTL-A-A08-8) Avail: NTIS

The questions of how maintenance affects system quality, measured as effectiveness, as well as to what extent maintenance is profitable, are both important and of immediate interest. Examples of models which illustrate these aspects are discussed. They are related to the following elements in maintenance: (1) supervision of function, (2) control of function, (3) remedial maintenance, and (4) preventive maintenance. Author

N71-15172# Peat, Marwick, Livingston and Co., Washington, D.C.
NATIONAL INTERCITY TRAVEL: DEVELOPMENT AND IMPLEMENTATION OF A DEMAND FORECASTING FRAMEWORK Final Report
Raymond H. Ellis and Paul R. Rassam Mar. 1970 160 p refs
(Contract DOT-T8-542)
(PB-192455) Avail: NTIS CSCL 13B

The development and application of a prototype methodology for predicting national passenger travel demands are described. It specifically takes account of competition among four modes; air, rail, bus and auto. Forecasts are prepared for the years 1975, 1980 and 1990. Interpretation and use of these forecasts should be considered within the exploratory context of the study. Author (USGRDR)

N71-15199*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
MANAGEMENT: A CONTINUING BOOK BIBLIOGRAPHY WITH INDEXES
Jane S. Hess, comp. Nov. 1970 213 p refs
(NASA-TM-X-66546; LL-BIBL-1) Avail: NTIS CSCL 05A

This bibliography is a comprehensive listing of books covering the management sciences in the Langley Library collection through April 1970. The guidelines used in compiling the bibliography are as follows: (1) no journal articles have been included; however, a list of management and management-related journals is given in an appendix; (2) no report literature has been included since it is being adequately covered elsewhere, (3) the format has been patterned after SP-7500; (4) the bibliography covers old as well as modern techniques of management, including applications of computers and statistical methods. Author

N71-15631# National Science Foundation, Washington, D.C.
FEDERAL FUNDS FOR RESEARCH DEVELOPMENT AND OTHER SCIENTIFIC ACTIVITIES, FISCAL YEARS 1969, 1970, AND 1971, VOLUME 19
Sep. 1970 273 p refs
(NSF-70-38) Avail: SOD $2.00

A comprehensive body of statistical information is provided on the size and scope of Federal obligations for scientific activities, the purposes to which funds are directed, and the important trends in major funding areas. Reported are R&D obligations by agency and agency subdivision, the character of the work, the performers of the work, and the distribution of research funds by fields of science. Also provided are data on R&D plant, on scientific and technical information activities, general purpose scientific data, and distrubution of R&D funds by States. Author

N71-15649# Congress. Senate. Committee on Government Operations.
TFX CONTRACT INVESTIGATION FROM PERMANENT SUBCOMMITTEE ON INVESTIGATIONS
John L. McClellan Washington GPO 1970 100 p refs Rept. presented by the Comm. on Govt. Operations at the 91st Congr., 2nd Sess., 18 Dec. 1970
(Rept-91-1496) Avail: US Capitol, Senate Document Room

Congressional investigations into the TFX contract award is reported, including a brief summary of the origin of the variable sweep airplane and the original military requirements. The research and development program is examined, and includes early discovery of major technical design problems which led to recommendations to redesign the F-111B. Test pilots' warnings of serious problems from 1965 to 1967 are summarized. The costs of the program and an analysis of the contracts are discussed. An overall summary of the TFX program and the conclusions reached from the hearings are presented. R.B.

N71-15695# General Accounting Office, Washington, D.C.
NEED TO IMPROVE EFFECTIVENESS OF CONTRACTOR PROCUREMENT SYSTEM REVIEWS: DEPARTMENT OF DEFENSE, NATIONAL AERONAUTICS AND SPACE ADMINISTRATION Report to the Congress by the Comptroller General of the United States
B. M. Keller 18 Aug. 1970 39 p refs
(B-169434) Avail: Issuing Activity

The procurement systems of certain government contractors are reviewed. The investigations shows some of the contractors have unacceptable procurement systems. The following changes are recommended: (1) develop definitive standards for approval and/or disapproval of contractors' procurement system, (2) broaden the applicability of the CPSR program to include contractors with largely noncompetitive fixed-price type contracts negotiated on the basis of cost, (3) perform annual in-depth reviews on a more selective basis, (4) explore incentives that will encourage contractors to accept CPSR recommendations on improving their subcontracting practices and (5) encourage full utilization of CPSR reports by CPSR managers to correct noted weaknesses in their program implementation. Author

N71-16709# Maryland Univ., College Park.
ORGANIZATION BEHAVIOR AND DESIGN: PERSPECTIVES AND PERCEPTIONS
Victor F. Phillips, Jr. Oct. 1970 118 p refs Presented at the Symp. on Organizational Behavior in the Air Force, Colo. Springs, Colo., 11 -12 Aug. 1969
(Contract F44620-67-C-0093)
(AD-714597; AFOSR-70-2310TR) Avail: NTIS CSCL 5/10

The document reports on seven papers presented at a symposium on organizational behavior in the Air Force, concerned with scientific research being conducted by or with the support of various Air Force organizations in organizational behavior patterns and trends. Author (GRA)

N71-16873*# George Washington Univ., Washington, D.C.
SCIENTIFIC METHOD, ADVERSARIAL SYSTEM AND TECHNOLOGY ASSESSMENT
Louis H. Mayo Nov. 1970 114 p refs Presented at the Eng. Found. Res. Conf., Andover, N.H., Aug. 1969 Revised *Its* Monograph No. 5
(Grant NGL-09-010-030)
(NASA-CR-116249) Avail: NTIS CSCL 05A

Scientific method and adversarial system as techniques of inquiry in the process of technology assessment are examined. Scientific method is an obvious mode of inquiry with respect to the factual and predictive elements of technology assessment and may have some degree of usefulness even in determining existing and emerging patterns of social interests. Adversarial system, or advocacy in the broad sense, will be utilized in the assessment forum for the purpose of gaining recognition for certain types of effects of given technological applications and persuading the assessment entity to apply evaluative criteria to such effects (in terms of magnitude and social desirability) which will reflect the advocate-participant's preferences. It is concluded that situations of uncertainty as to facts and differences in social value preferences among participants affected by prospective assessment outcomes will inevitably lead to and involve the adversarial system as a technique of inquiry in the process of technology assessment. Author

N71-16874# Defence Documentation Center, Alexandria, Va.
URBAN ECONOMICS AND PLANNING, VOLUME 1 Report Bibliography, Jun. 1962 Mar.1970
Oct. 1970 292 p refs
(AD-714500; DDC-TAS-70-73-1) Avail: NITS CSCL 13/2

The bibliography includes annotated references to reports on urban area problems, regional planning and development, sociometrics, urban renewal, transportation, traffic, noise and communications. Corporate author-monitoring agency, and subject, indexes are included. GRA

N71-16884*# George Washington Univ., Washington, D.C. Program of Policy Studies in Science and Technology.
ADVOCACY IN TECHNOLOGY ASSESSMENT
Ernest M. Jones (Florida Univ.) Nov. 1970 80 p refs *Its* Staff Discussion Paper No. 209
(Grant NGL-09-010-030)
(NASA-CR-116250) Avail: NTIS CSCL 05D

The most significant aspects of the contexts in which advocacy respecting technology assessment occurs in legal process are theorized as: participants, perspectives, situations, base values, strategies, outcomes, and effects. Criteria of adequate technology assessment in legal process are proposed respecting each of these contextual aspects, and respecting the problem perception, problem formulation, selection, utilization, determination, and evaluation sequences of internal operations of assessment systems. Finally, the potential contributions of advocacy, conceived both as strategies of claimants and as a mode of inquiry designed into a decisional system, are systematically evaluated with the proposed criteria of adequate assessment. The general conclusion is that criteria of adequate assessment cannot be met without a prominent role for advocacy. Author

N71-16895# National Science Foundation, Washington, D.C.
GRADUATE STUDENT SUPPORT AND MANPOWER RESOURCES IN GRADUATE SCIENCE EDUCATION, FALL 1969. AN ANALYSIS OF STUDENT ENROLLMENTS, SOURCES OF STUDENT SUPPORT, FACULTY, AND POSTDOCTORALS IN DOCTORATE DEPARTMENTS
Sep. 1970 92 p refs
(NSF-70-40) Avail: SOD $1.00

Statistical data are summarized for graduate student support, postdoctorals, and graduate faculty as of fall 1969 in doctorate granting institutions applying for grants from the National Science Foundation for 1970. The graduate enrollment in 2894 science doctorate departments of 224 universities and colleges was distributed as follows: engineering, 28%; social sciences, 20%; physical sciences, 19%; life sciences, 17%; mathematical sciences, 8%; and psychology, 7%. More than 81% of the full-time graduate science students received major financial assistance from outside sources. The U.S. Government financed 37% of the full-time graduate students; institutions and State and local governments, 36%; other sources, such as industry, private foundations, 9%. The remaining 19% relied upon self-support, including loans, savings, and family assistance, to finance their education. A list of institutions

participating in the graduate traineeship program statistical tables, instructions and consolidated departmental data sheets, and consolidated departmental summaries are included. F.O.S.

N71-16896# National Science Foundation, Washington, D.C.
RESEARCH AND DEVELOPMENT IN INDUSTRY, 1968. FUNDS, 1968, SCIENTISTS AND ENGINEERS, JANUARY 1969
Marian Mieremet, Robert O. Santos, and John R. Chirichiello Jul. 1970 118 p refs
(NSF-70-29) Avail: SOD $1.00

The results of the 1968 survey of industrial research and development are presented. Highlights of the report include: (1) In *recent years industrial firms have performed about 70% of all* research and development in the United States. (2) About 36% of the scientists and engineers in industry were involved in R and D activities in January 1969. Of this 36%, about two-fifths worked on federally financed R and D projects. (3) In 1968, 90% of the $8.6 billion in R and D funds furnished by Federal agencies to industry came from DOD and NASA. DOD funded 104,600 R and D scientists and engineers in 1968, at an average cost of $51,800 per professional, NASA projects averaged $66,000 per scientist or engineer and included 35,000 professionals. (4) The Pacific States accounted for 26% of the industrial total, with $4.6 billion in 1968. Statistical tables showing the distribution of funds are also included. F.O.S.

N71-16987# Oklahoma Univ. Research Inst., Norman.
STATE OF OKLAHOMA AIRPORT PLAN
May 1970 150 p refs Sponsored in part by Okla. Aeron. Comm. and HUD Prepared for Okla. Ind. Develop. and Park Dept. and Okla. Aeron. Comm.
(PB-194937) Avail: NTIS CSCL 01E

A systematic plan for airport development over the time period to 1980 was considered. To accomplish this task, the project was separated into five work elements: (1) verification and classification of airports; (2) determinants of airport facilities; (3) aviation development model; (4) test of the model; (5) schedule of projected investments for Oklahoma airports. Author (GRA)

N71-16988# Regional Planning Commission, Cleveland, Ohio.
DATA FILE EDITING AND PRELIMINARY ANALYSIS, CLEVELAND-HOPKINS AIRPORT ACCESS STUDY Final Report
May 1970 174 p
(Contract DOT-OS-A9-023)
(PB-195047; DOT-OS-A9-023-3) Avail: NTIS CSCL 13B

An analysis of the impact of the rapid rail extensions on airport users was conducted before the opening of the rail transit service to the airport and another survey was conducted one year later after the rail rapid service was opened. The data from these surveys were compared to determine the effect of the new rail transit service on the choice of travel mode by the different groups of airport users. The report documents the procedures used in the preparation of files for analysis of the surveys. Author (GRA)

N71-17532# Congress. House. Committee on Science and Astronautics.
ESTABLISHING THE OFFICE OF TECHNOLOGY ASSESSMENT AND AMENDING THE NATIONAL SCIENCE FOUNDATION ACT OF 1950
Emilio Q. Daddario Washington GPO 1970 25 p refs Rept. to accompany H.R. 18469 presented by the Comm. on Sci. and Astronaut. to the Comm. of the Whole House on the State of the Union, 91st Congr., 2d Sess., 9 Sep. 1970
(Rept-91-1437) Avail: US Capitol, House Document Room

The committee's favorable recommendation on H.R. 18469 is reported. The purpose of the bill is to establish an Office of Technology Assessment for the Congress as an aid in the identification and consideration of existing and probable impacts of technological application, and to amend the National Science Foundation Act of 1950, as amended, to conform therewith. Author

N71-17632# Committee on Armed Services (U.S. House).
REVIEW OF INDEPENDENT RESEARCH AND DEVELOPMENT PROGRAM MANAGEMENT From Armed Services Investigating Subcommittee, 11 Sep. 1970
Washington GPO 1970 25 p refs Rept. under the authority of H. Res. 105 presented by the Comm. on Armed Serv., 91st Congr., 2 Sess., 18 Sep. 1970
Avail: US Capitol, House Document Room

The review contains observations on Independent Research and Development (IR and D) in industry, Department of Defense support of IR and D in industry, and Department of Defense policies and management techniques for protecting Government interests in IR and D. Topics discussed include: IR and D costs in defense procurement, management and control of IR and D programs, and accounting, negotiation, and coordination problems, as well as those met in complying with IR and D fund ceilings. E.C.

N71-17699# RAND Corp., Santa Monica, Calif.
COMMENTS ON CYBERNETICS AND MANAGEMENT OF LARGE SYSTEMS
E. C. De Land Mar. 1970 11 p Presented at the Symp. on Global Systems Dyn., Charlottesville, Va., 17 – 19 Jun. 1969
(AD-715251; P-4303) Avail: NTIS CSCL 5/11

The document comments on the premise that a technologist has a citizens responsibility to contribute to and attempt to develop a rational social structure. At the same time there must be a way to leave responsible room for the Arts and Letters, for human needs and feelings, for human fallibility, and for human genius. In short, there must be a way for humans living within a technological society to maintain the upper-hand over the machine and over the organization. Author (GRA)

N71-17726# Office of The Director of Defense Research and Engineering, Washington, D.C. Office for Lab. Management.
THE DEFENSE IN-HOUSE LABORATORIES
E. M. Glass 15 Sep. 1970 73 p refs
(AD-715213; MAR-70-1) Avail: NTIS CSCL 14/2

The Center for Strategic and International Studies at Georgetown University is conducting a broad study on U.S. R and D Management. This report was prepared to review the issues pertaining to the Defense inhouse laboratories and provide a historical perspective for the period 1961-1970. The review covers the problems identified, the actions taken, the problems that are still evident, and the various options available to make these organizations more effective. The interpretation of historical events given here and the options described are presented to stimulate discussion and dialogue concerning the important matter of in-house governmental laboratories. As such, they do not necessarily coincide with the official views of the Department of Defense. Author (GRA)

N71-17798# Civil Aeronautics Board, Washington, D.C.
CIVIL AERONAUTICS BOARD CAREERS FOR ECONOMISTS AND TRANSPORTATION INDUSTRY ANALYSTS
[1970] 12 p
Avail: Issuing Activity

Economist and air transportation analyst employment opportunities and qualification specifications are outlined. Employee benefits provided by the Civil Aeronautics Board are summarized. E.C.

N71-18004# Civil Aeronautics Board, Washington, D.C.
CAREERS FOR ACCOUNTANTS AND AUDITORS
[1970] 9 p
Avail: Issuing Activity

Employment as an accountant or auditor for the Civil Aeronautics Board is discussed with respect to academic requirements, experience, salary, and promotion opportunities. R.B.

N71-18017 RAND Corp., Santa Monica, Calif.
PREFERENCES FOR MULTI-ATTRIBUTED ALTERNATIVES
Howard Raiffa Apr. 1969 115 p refs
(Contract DOT-3-0008)
(RM-5868-DOT/RC) Copyright. Avail: Issuing Activity

Several techniques are presented for assessing the utility of complex alternatives, including the problem where each alternative can be described by a series of attributes which are interdependent in various ways. A hierarchical structuring procedure for obtaining a relevant list of attributes is described and examples are given from transportation and medical treatment problems. Each alternative or consequence is assumed to be described by a sequence of numbers or numeraires, with the i-th number interpreted as its score or performance on the i-th attribute. The basic problem is to assess a utility function over an r-tuple of numeraires. Author

N71-18070# Institute for Defense Analyses, Arlington, Va. Science and Technology Div.
CASE STUDIES OF ONR SUPPORTED RESEARCH
Edward I. Salkovitz, Ronald W. Armstrong, and John P. Howe Oct. 1970 98 p refs
(Contract DAHC15-67-C-0011)
(AD-714860; RP-P-645; IDA/HQ-70-11545) Avail: NTIS CSCL 5/1

The purpose of the paper is to improve knowledge about the conduct of basic research programs on the basis of experience gathered in four Material Science programs: (1) Molybdenum and other refractory metals; (2) Boron components and inorganic polymers; (3) Cryogenics; (4) Dislocations. The historical beginnings of these programs are discussed; the development and evolution of the programs and their eventual technological and scientific importance are reviewed. It is found that all four programs were well selected and well managed; that interaction with the academic community was considerable; that the four programs had great impact on university curricula; that technology has benefited; that the research was sound and attracted outstanding researchers; and that the program trained students who have developed to become managers in DOD, NSF, AEC, and NASA. It is concluded that it may be possible to define and utilize criteria to measure probable success of a planned research program. It is also concluded that the determination of sequential steps and goals is necessary to a successful program and that it is possible to determine when a research program should be terminated. It is further concluded that adequate communication between science researcher and potential user of new knowledge does not now exist. It is recommended that new mechanisms should be established whereby scientists and engineers exchange information and help to guide research programs. Author (GRA)

N71-18072# Department of Transportation, Washington, D.C.
NATIONAL TRANSPORTATION PLANNING MANUAL (1970 – 1990). MANUAL A: GENERAL INSTRUCTIONS
Jul. 1970 187 p
(PB-194964; BOB-004-S700028) Avail: NTIS

General instructions are given on how to present and summarize cooperative comprehensive and continuing planning for the economic development of a national transportation system. The overall process covers all modes of domestic transportation and includes both private and public sectors of the economy. G.G.

N71-18073# Commerce Dept., Washington, D.C.
GOVERNMENT AND TECHNOLOGY: THE CHALLENGE OF THE 70's
Myron Tribus 1970 12 p Presented at the 55th Ann. Meeting of the Natl. Conf. on Weights and Meas., Salt Lake City, 14 Jul. 1970
Avail: Issuing Activity

Cooperation involving State, local, and Federal governments and the private sector is advocated to keep the technological society running and to smooth the interface between technology and society. Emphasis is placed on the distribution of wealth and its creation by the growth of technology. G.G.

N71-18093# Institute of Transport Aviation, Paris (France).
TRAFFIC FORECASTS, FLEET OPTIMIZATION, PLANNING WITHIN ENTERPRISES [PREVISION DE TRAFIC, OPTIMISATION, DES FLOTTES, PLANIFICATION D'ENTREPRISE]
1970 70 p refs Meeting held at Paris, 29 May 1970
(Rept-1970/7-E) Avail: NTIS

CONTENTS:

1. ORIGIN AND WORK OF THE GCEA T. Baumgart p 7–14

2. FLEET OPTIMIZATION METHODS J. Agard (Air France, Paris) p 15–35 refs

3. TRAFFIC FORECASTS J. D. Blanchet (Secretariat Gen. A l'Aviation Civile, Paris, France) p 37–57 refs

4. PLANNING WITHIN THE ENTERPRISES BELONGING TO THE AVIATION ECONOMIC CYBERNETICS GROUP J. Arnaud (Air Inter, Lignes Aeriennes Interieures, Paris, France) p 59–67

N71-18094# Institute of Transport Aviation, Paris (France). Air Transport Div.
ORIGIN AND WORK OF THE GCEA
T. Baumgart *In its* Traffic Forecasts, Fleet Optimization, Planning within Enterprises 1970 p 7–14
Avail: NTIS

The international aviation cybernetics-economic study group examines the working methods of a number of economic research bodies belonging to airlines, aircraft manufacturers, airport authorities and the US Administration. Discussed are air traffic forecasts, air fleet optimization model formations, and company planning and decision making methods. G.G.

N71-18095# Air France, Paris.
FLEET OPTIMIZATION METHODS
J. Agard *In* Inst. of Transport Aviation Traffic Forecasts, Fleet Optimization, Planning within Enterprises 1970 p 15–35 refs

Avail: NTIS

Complex fleet selection and allocation studies for air transport estimates include economic calculations and operational research. Mathematical models and computer simulations are used to select the best aircraft after estimating a traffic segment, lowest aircraft operating costs in a given range of qualities, and fleet network needs. Optimization criteria for the mathematical decision models include: (1) maximization of profit; (2) ideal growth in turnover; (3) quality of service; (4) regularity of annual investment; (5) homogeneity of fleets; (6) a positive balance in foreign currency; (7) regular employment; and (8) good industrial development. G.G.

N71-18096# Secretariat General a l'Aviation Civile, Paris (France). Air Transport Div.
TRAFFIC FORECASTS
J. D. Blanchet *In* Inst. of Transport Aviation Traffic Forecasts, Fleet Optimization, Planning within Enterprises 1970 p 37–57 refs

Avail: NTIS

Long, medium or short terms for air traffic planning estimates are evaluated and the advantages of a cyclical overhaul each year are outlined. Planning includes an analysis of internal and external factors with an explanation for the differences between forecasts and results and the translation of general policy into management objectives and decisions. The work takes place through the decision year n for the detailed preparation of year n + 1; implementation of the plan includes inevitable corrections by means of differentials and correlations with budgeting and control panel data. G.G.

N71-18097# Air Inter, Lignes Aeriennes Interieures, Paris (France).
PLANNING WITHIN THE ENTERPRISES BELONGING TO THE AVIATION ECONOMIC CYBERNETICS GROUP
J. Arnaud *In* Inst. of Transportation Aviation Traffic Forecasts, Fleet Optimization, Planning within Enterprises 1970 p 59–67

Avail: NTIS

Forecasting needs in the air transport field are recognized in market research and econometric approach. The former studies traffic generated by different groups of potential travellers, who are grouped by geographical region, purpose of travel, company departments, etc.; behavior of each group is assessed with varying degrees of accuracy, generally by extrapolating that previously recorded by means of surveys. The economics approach tries to explain traffic through mathematical modeling by bringing in exogenous variables for which the trends are better known than the trends in the variable being studied. The accuracy of both methods on the quality of statistical information available. G.G.

N71-18099# Regional Science Research Inst., Philadelphia, Pa.
ECONOMIC IMPACT OF THE DALLAS-FORT WORTH REGIONAL AIRPORT ON THE NORTH CENTRAL TEXAS REGION IN 1975
Robert E. Coughlin, Robert C. Douglas, Thomas W. Langford, Jr., and Benjamin H. Stevens Jan. 1970 78 p refs Sponsored in part by Dept. of Housing and Urban Develop.
Avail: NTIS

Air transportation activities are projected for the Dallas-Fort Worth area. Proposed dollar value of purchases and employment resulting from airport construction are discussed, emphasizing cost per unit, output determination from operating levels, adjustment for increased productivity, and total output and employment. Gross and net economic impact of purchases by airport activities of north central Texas region are reviewed, along with air transportation and regional growth. J.A.M.

N71-18118 Michigan Univ., Ann Arbor. Bureau of Business Research.
ALTERNATIVE LOGISTICS SYSTEMS FOR EXPENSIVE PARTS: AN AIRLINE STUDY
William G. Browne 1969 242 p refs
Copyright. Avail: NTIS

The overhaul and inventory procedures of commercial airlines for major aircraft parts are analyzed, along with the policy alternatives for providing the services with increased efficiency. A computer simulation was developed to examine the impact on cost and service levels of different inventory and overhaul configurations for the GE-4 engine, which will be used to propel the SST. Experimentation with the different locations of overhaul facilities and inventory was conducted. The simulation included provisions for changes in ownership, engine status, number of overhaul facilities in the system, engine failure rates, overhaul times, and rates of fleet growth and system expansion. A survey of management attitudes toward increased consolidation indicates that overhaul facility location is the most critical factor inhibiting consolidation efforts. The major conclusions were: (1) considerable cost savings can be achieved through policy changes providing for intercompany consolidation of engine overhaul and storage facilities, and (2) the attainment of an overhaul and inventory consortium with more than three or four members is likely to be most difficult, considering present industry attitudes. Author

N71-18264# Pennsylvania Univ., Philadelphia. Moore School of Electrical Engineering.
A PROTOTYPE MANAGEMENT DECISION SYSTEM FOR PLANNING AND CONTROL
Ronald Segal Nov. 1970 34 p refs
(Contract N00014-67-A-0216-0007)
(AD-715663; TR-71-11) Avail: NTIS CSCL 5/1

The value of timely information as an aid in management decision making has long been recognized. For well structured and predictable problems, conventional batch processing computer techniques and management information systems technology appear to be capable of keeping pace with the rapidly increasing information needs. However, unstructured and poorly defined problems often confront high level managers in military organizations, industry or government. It appears that an interactive Management Decision System (MDS), operated and directly controlled by the manager, could provide significant assistance in making the required decisions. The report describes a prototype system that has been implemented to illustrate and evaluate the concept, and to form a basis for subsequent research. Author (GRA)

N71-18709# Naval Intelligence Command, Alexandria, Va. Translation Div.
AN ANALYSIS OF PROBLEMS OF ORGANIZATION IN SCIENCE
G. M. Dobrov 16 Dec. 1970 21 p refs Transl. into ENGLISH from the book "Analiz Problem Organizatsii Nauki" Novosibirsk, Nauka, 1967 p 101–120
(AD-715752; NIC-TRANS-3150) Avail: NTIS CSCL 5/1

Contents: Science as an information process; Scientific development; Men of science; and Planning and forecasting in science. GRA

N71-18857# Defense Documentation Center, Alexandria, Va.
ANNUAL HISTORICAL SUMMARY DEFENSE DOCUMENTATION CENTER, 1 JULY 1969 – 30 JUNE 1970
1 Dec. 1970 52 p
(AD-715500) Avail: NTIS CSCL 5/2

The summary presents highlights of the more significant activities and achievements of the Defense Documentation Center during FY 1970 including: (a) DDC and the Scientific and Technical Community. The DDC role in the DoD Scientific and Technical Information Program continued to expand from providing secondary distribution of Defense-related technical reports to furnishing a coordinated mix of scientific, technical, and management information products and services tailored to the needs of users of the information. (b) DDC Mission Responsibilities. Basic responsibilities are summarized as: (1) acquiring, storing, announcing, retrieving, and providing secondary distribution of results of RDT and E performed or sponsored by military departments and other DoD components, (2) operating the central DoD computer-based data banks of technical and management information resulting from Defense-related efforts in research and technology, and (3) planning and executing a development program to introduce new or improved systems and techniques related to information transfer. (c) Operational and Developmental Activities. The summary describes activities and accomplishments during the year including those in the areas of: (1) technical report services, (2) research and engineering management information services including a variety of data banks and special services, (3) on-line tretrieval, (4) selective documentation services, (5) automatic data processing, (6) microform systems, (7) language and indexing systems, and (8) supporting customer relations and management functions. Author (GRA)

N71-19244*# National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.
RELIABILITY AND QUALITY ASSURANCE GUIDELINE FOR GOVERNMENT-FURNISHED EQUIPMENT CONTROL
Feb. 1971 10 p
(NASA-TM-X-66889; MSC-03613) Avail: NTIS CSCL 22D

Guidelines to recipients of government furnished equipment in the preparation of internal control programs are presented. Equipment is identified and classified as: (1) Class 1 – acceptable for use in flight, (2) Class 2 – unacceptable for flight, but may be used for ground testing or training in a hazardous environment, and (3) Class 3 – unacceptable for flight or use in a hazardous environment, but may be used for nonhazardous training or display purposes. Author

N71-19321# Joint Publications Research Service, Washington, D.C.
MODEL SCIENTIFIC PRODUCTION ASSOCIATION
V. Beletskaya et al 22 Feb. 1971 9 p *Transl. into ENGLISH* from Ogonek (Moscow), no. 2, 1971 p 16 – 17
(JPRS-52446) Avail: NTIS

A series of interviews and conversations with officials and engineers of a model scientific production association is reported. Among the articles designed and developed by the production combine are integrated microcircuits, miniaturized television sets, radio communications equipment and electronic computers. R.B.

N71-19697# Michigan Univ., Ann Arbor. Inst. for Social Research.
CONFLICT STRATEGIES RELATED TO ORGANIZATIONAL THEORIES AND MANAGEMENT SYSTEMS Technical Report, 1 Oct. 1970 – 1 Oct. 1971
Rensis Likert and David G. Bowers Dec. 1970 35 p refs
(Contract N00014-67-A-0181-0013)
(AD-716018) Avail: NTIS CSCL 5/10

The report describes in theoretical terms the relevance of management systems theory to the problem of conflict management. Possibilities for resolving conflict constructively are seen as residing in the use of an interaction influence system characterized by a participative-group structure. Author (GRA)

N71-19698# National Planning Association, Washington, D.C.
CASE STUDIES OF GOVERNMENT COOPERATION IN FOUNDING NEW INDUSTRIES: WITH IMPLICATIONS FOR MARINE RESOURCE DEVELOPMENTS Technical Report, 1966 – 1970
S. Sterling McMillan and Miller B. Spangler Oct. 1970 133 p refs
(Contract NSF C-468)
(PB-196038) Avail: NTIS CSCL 05C

Contents: The federal role in the development of the synthetic rubber industry; The growth of civilian atomic energy; The Communications Satellite Corporation. GRA

N71-19769# RAND Corp., Santa Monica, Calif.
R AND D IN SOVIET AVIATION
Arthur J. Alexander Nov. 1970 49 p refs
(Contract F44620-67-C-0045; Proj. RAND)
(AD-716410; R-589-PR) NTIS CSCL 5/3

Research, design, development, and manufacture of Soviet aircraft are concentrated in the Ministry of Aviation Industry. However, the various functions are performed by administratively separate organizations. The present structure can be traced back to 1939, when a reorganization of the industry raised a number of young individuals to positions of authority following a period of intense purges. Information flows link the separate organizations. Research institutes provide design bureaus and manufacturing plants with handbooks of aerodynamic forms and structures and lists of approved materials and manufacturing techniques. Design starts with a small, short-term effort called the pre-project, which takes only a few months to prepare. Simplicity, commonality, and design inheritance are important features of design practice. Author (GRA)

N71-19922# National Science Foundation, Washington, D.C.
IMPACT OF CHANGES IN FEDERAL SCIENCE FUNDING PATTERNS ON ACADEMIC INSTITUTIONS, 1968 – 1970
Dec. 1970 82 p
(NSF-70-48) Avail: SOD $0.75

The replies to two surveys, undertaken in spring 1969 and 1970, show that, while total expenditures for research and education in the sciences had increased over the 2-year period covered, these expenditures had not kept pace with the combined increases in general enrollment and higher costs. Expenditures from non-Federal funds compensated at least in part for the leveling trend of Federal funding. Private institutions, in general, and the largest public institutions reported the most serious curtailment of monies for science, and of Federal funds in particular. Large numbers of academic officials reported impairment of graduate programs and research, curtailment of facilities and equipment, adverse career and employment impacts, administrative difficulties,

and lowered morale of students and science faculty. New or developing institutions and departments frequently reported problems in meeting planned goals as a result of changes in Federal funding. Author

N71-20109# California Univ., Livermore. Lawrence Radiation Lab.
CLOSER TOLERANCES: ECONOMIC SENSE
James B. Bryan 17 Mar. 1970 20 p Presented at the 1970 Gen. Assembly CIRP, Turin, 28 Aug.–6 Sep. 1970 Submitted for publication Sponsored by AEC
(UCRL-72380; CONF-700831-1) Avail: NTIS

The economics of closer tolerances in manufacturing are discussed. Examples show that improvements can be made in the following areas of consumer interest: reduced initial cost, reduced operating cost, increased lifetime, increased reliability, increased performance, reduced undesirable side effects, ease of use, better portability and durability through miniaturization, ease of repair through the use of fewer parts which are interchangeable, and improved appearance. The principle example used in support of this contention is a model airplane engine costing less than $6.00, which routinely holds a tolerance of 50 microinch on the clearance between the piston and cylinder. Author

N71-20565# National Science Foundation, Washington, D.C.
NATIONAL PATTERNS OF R AND D RESOURCES. FUNDS AND MANPOWER IN THE UNITED STATES, 1953 – 1971
Dec. 1970 46 p refs
(NSF-70-46) Avail: SOD $0.50

Data on the support and performance of research and development in the United States are presented. The data show the pattern of utilization of national scientific and engineering resources, both funds and manpower, among the various sectors of the economy. Historical trends and interrelationships for all types of research and development are included. Author

N71-20770# Norwegian Computing Center, Oslo (Norway).
PLANNING THE LAYOUT, EQUIPMENT MANNING, AND OPERATIONS OF A WAREHOUSE
Jan Evensmo 1970 16 p refs
Avail: NTIS

The problems connected with warehouse projecting and the importance of evaluating the operating characteristics and costs of different warehouse alternatives at the planning stage are dealt with. It is shown that computer simulation is a very useful tool in the projecting, particularly when a computer simulation language like SIMULATM is used. Examples of computer printouts are shown, and the importance of these as a communication channel between programmers, consultants, and directors is highlighted. The simulation technique led to a solution with a substantial saving compared with the solutions which otherwise would have been chosen. Author (ESRO)

N71-20797# Army Aviation Systems Command, St. Louis, Mo. Flight Standards and Qualification Directorate.
HUMAN FACTORS ENGINEERING MOCK-UP FACILITY
Charles E. Righter May 1970 25 p refs
(AD-717026; FS/Q-TR-70-4; USAA VCOM-TR-70-12) Avail: NTIS CSCL 5/5

The report is a brief study of the value of a mock-up facility as a management tool. Included is a general discussion for the need of this facility along with area and space requirements, skills and number of personnel required and a budgeting estimate. Also included is a proposed schedule for installation and completion of all areas. Author (GRA)

N71-21043# Aeronautical Systems Div., Wright-Patterson AFB, Ohio.
A DISCRIMINANT ANALYSIS MODEL FOR RATING RESEARCH AND DEVELOPMENT DATA PROGRAMS
Technical Report, 1 Apr. 1969 – 1 May 1970
Eddie E. Gordhammer, Jr. Oct. 1970 182 p refs
(AD-716812; ASD-TR-70-22) Avail: NTIS CSCL 5/1

The research was initiated to develop and demonstrate a discriminant analysis method for rating technical data associated with Department of Defense (DoD) and National Aeronautics and Space Administration (NASA) research and development programs. In addition, it was designed to identify any differences in the technical data rating philosophies of the participating decision-making groups. The research included a review of the literature associated with research and development rating methods as well as the theory underlying discriminant analysis. The principal data-gathering instruments were two questionnaires. A three-model data evaluation system was developed utilizing the method of discriminant analysis to perform the classification function. The three models operate in tandem to process the questionnaire data, calculate minimum mean estimate (MME) values, compute the necessary linear functions known as discriminant functions, evaluate classification functions, determine the probability associated with the largest discriminant function, and classify new data. The validity of the model was demonstrated by evaluating the technical data program associated with a major DoD weapon system development program. Author (GRA)

N71-21086# Joint Publications Research Service, Washington, D.C.
AUTOMATION OF MANAGEMENT
N. Moiseyev 15 Mar. 1971 14 p Transl. into ENGLISH from Nauk. i Zhizn. (Moscow), no. 1, 1971 p 2 - 7
(JPRS-52623) Avail: NTIS

Automated management systems are discussed for decision making and systems control to meet the demands of the second industrial revolution. Differences between the automation of production and the automation of management are cited. The effects of adopting automatic control systems are considered along with computer programming, personnel training, and centralization of information system problems. E.C.

N71-21099 Northwestern Univ., Evanston, Ill. Dept. of Industrial Engineering and Management Sciences.
THE RELATIONSHIP OF INTERGROUP ORGANIZATIONAL CLIMATE WITH COMMUNICATION AND JOINT DECISION MAKING BETWEEN TASK INTERDEPENDENT R AND D GROUPS, PART 1
Richard Timothy Barth (Ph.D. Thesis) Aug. 1970 259 p
(Rept-70/34-Pt-1) Copyright. Avail: Issuing Activity

The specific goal of the research reported was to test, based on data obtained through a field study in actual operating research and development organizations, fifteen propositions concerning the effects of intergroup climate, as defined for a given pair of task-interdependent groups, on the level of perceived communication problems experienced by members of the groups dealing with eath other. In each of these propositions, the level of task-interdependence perceived to exist between the groups as taken into account. Several additional propoositions were concerned with: (1) the relationship between perceived communication problems, the primary mode of joint decision making used by the

groups, and the quality of coupling achieved; and (2) criteria used by managers when rating the effectiveness of the participating groups. Data for proposition testing were collected from 256 participatns representing 60 working groups in one industrial and nine government R and D laboratiries. Both questionnaires and individual interviews were used to collect the data. Author

N71-21100 Northwestern Univ., Evanston, Ill. Dept. of Industrial Engineering and Management Sciences.
THE RELATIONSHIP OF INTERGROUP ORGANIZATIONAL CLIMATE WITH COMMUNICATION AND JOINT DECISION MAKING BETWEEN TASK INTERDEPENDENT R AND D GROUPS, PART 2
Richard Timothy Barth (Ph.D. Thesis) Aug. 1970 167 p *refs*
(Rept-70/34-Pt-2) Copyright. Avail: Issuing Activity

The data analysis and results are presented of a test, based on information obtained through a field study, of the propositions concerning the effects of intergroup climate on the level of perceived communication problems experienced by members of the groups. Two complementary methods were used for analyzing different sets of the data: multiple regression analysis, and path analysis. Data analysis and proposition testing by these methods are reported in separate sections, and are preceded by a discussion of some of the important characteristics of the methods utilized. Author

N71-21615 *National Lending Library for Science and Technology, Boston Spa (England).*
PROGNOSTICS: A NEW SCIENCE [PROGNOSTIKA: NOVAYA NAUKA]
D. M. Gvishiani et al Sep. 1970 21 p Transl. into ENGLISH from Buduschee Nauki, Mezhdunar. Ezhegodnik (Moscow), 1970 p 28-48
(NLL-RTS-6095) Avail: Natl. Lending Library, Boston Spa, Engl.: 42s; 7 NLL photocopy coupons

The objectives and methodology of forecasting are discussed along with trends in economic and research and development forecasting. It is emphasized that scientifically-substantiated methods of forecasting must be elaborated as well as a general theory of forecasting based on the concept of dialectical materialism. E.C.

N71-21628# Texas Transportation Inst., College Station.
AIR TRANSPORTATION FOR TEXAS: WORK PLAN
John C. Goodknight and John P. Doyle Aug. 1970 94 p refs
(PB-196933) Avail: NTIS CSCL 01B

The research and development efforts anticipated and required for the preparation of the Texas Air Transportation Plan are discussed. The work plan is largely concerned with proposed procedures to be developed and used for the estimation of demand for air transportation services and facilities. The document treats three overall classes of demand: (1) commercial passengers, (2) air cargo, and (3) general aviation. Techniques suggested for forecasting demands use socioeconomic characteristics of the region as the basis for these estimates. The work plan identifies potential sources for such information and a tentative schedule for collecting these data and the generalized schedule for completion of the several phases of the Texas Air Plan Study. Author (GRA)

N71-21698# Michigan State Univ., East Lansing. Dept. of Sociology.
MANAGEMENT, TECHNOLOGY AND BEHAVIOR OF WORK GROUPS Final Report
Charles A. Drake (Ph.D. Thesis) Dec. 1970 173 p refs
(Grant DL-91-24-69-49)
(PB-196467: DLMA-91-24-69-49(1)) Avail: NTIS CSCL 05I

The impact that technical structure variables of a work setting have on the relationship between supervisory style and the attitudes and behavior of industrial work groups is examined. The research explores the assumption that supervision is an integral part of an organization, and whatever characteristics the organization may have will influence the appropriate style of supervision. The research is based on an examination of 66 groups representing task and technological systems in a large chemical company, including research, legal, patent, manufacturing, industrial relations, controllers, and business information services. A short review of the literature on the structure of influence within organizations is given. Author (GRA)

N71-22026*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
SYSTEMS MANAGEMENT TECHNIQUES AND PROBLEMS
1 Feb. 1971 136 p refs Presented at the Systems Management Conf. (SM70), Los Angeles, 31 Mar.-2 Apr. 1970
(NASA-TM-X-64575) Avail: NTIS CSCL 05A

CONTENTS:

1. HISTORY AND TRENDS OF SYSTEMS ENGINEERING R. W. Hovey (TRW Sys. Group, Redondo Beach, Calif.) p 1-12 refs

2. SYSTEMS MANAGEMENT AND COMMON SENSE O. C. Boileau (Boeing Co., Seattle, Wash.) p 13-19 refs

3. SYSTEM ENGINEERING ARMY STYLE J. M. Rickhind (Army Materiel Command, Washington, D.C.) p 20-30 ref

4. BARRIERS TO RATIONALITY IN SYSTEMS MANAGEMENT J. Klimberg (JPL, Calif. Inst. of Tech., Pasadena) p 31-46 refs

5. SUBTLETIES OF SATURN SYSTEM ENGINEERING M. A. Cutchins (Auburn Univ., Ala.) p 47-57 refs

6. THE REVELATION OF SATURN-APOLLO S. E. McCrary p 58-63

7. EDUCATIONAL SYSTEM MANAGEMENT: PREMISES, PROBLEMS, PROGRESS, AND PORTENT Le Roy R. Rosen (Rosen Assoc., Woodland Hills, Calif.) p 64-72

8. SYSTEM MANAGEMENT APPLIED TO WATER RESOURCE DEVELOPMENT PLANNING A. R. Golze (Calif. Dept. of Water Resources) p 73-84 refs

9. SYSTEMS CONSIDERATION IN COASTAL ZONE MANAGEMENT J. J. Moore (Modern Management) p 85-92 refs

10. CROWNING OF A QUEEN M. M. Wolff (Harco Engineering) p 93-99 refs

11. CAN SYSTEMS MANAGEMENT REALLY SAVE MEDICINE? N. P. Thompson (Plato Alto Med. Res. Foundation, Calif.) p 100-106 ref

12. MANAGEMENT INFORMATION SYSTEMS FOR RETAIL INVENTORY MANAGEMENT B. Codner (Calif. State Coll., Los Angeles) p 107-117

N71-22027*# TRW Systems Group, Redondo Beach, Calif. Design and Integration Lab.
HISTORY AND TRENDS OF SYSTEMS ENGINEERING
Robert W. Hovey *In* NASA. Marshall Space Flight Center Systems Management Tech. and Probl. 1 Feb. 1971 p 1-12 refs

Avail: NTIS CSCL 05A

precise frequency standards provide the required flexibility in the use of air space and meet specific operational needs of air traffic developments. G.G.

N71-22384# Institute of Transport Aviation, Paris (France).
ECONOMIC ASPECTS OF THE EXPECTED DEVELOPMENT IN AIR TRANSPORT IN THE NEXT DECADE
Jean Mercier *In* Natl. Council for Civil Aviation Civil Aviation in the 1970's 1969 13 p
Avail: NTIS HC $6.00/MF $0.95

The main positive and negative economic aspects directly concerning commercial aviation development in the next decade are discussed: (1) financing appears to be one of the most complex problems to solve; (2) profitability, owing to heavier charges and labor costs, will perhaps not be able to maintain a good level, (3) vertical integration for extensions of transport activities at the level of tourism and customer facilities; (4) the uncertainty concerning the size of firms which will have to meet these commitments; (5) the consequences at the economic and organizational level of maintaining or increasing the flexibility in traffic; (6) adaptation to the changing market which is developing rapidly; and (7) the increasing importance of the operations preceding and following the actual transport process with regard to surface transport media. Author

N71-22389# Port of New York Authority, N.Y. Aviation Technical Services Div.
THE AIRPLANE AND THE AIRPORT
Louis Achitoff *In* Natl. Council for Civil Aviation Civil Aviation in the 1970's 1969 28 p
Avail: NTIS HC $6.00/MF $0.95

The parameters that require evaluation in the planning of an international airport intended to accommodate new generation, high capacity aircraft are discussed. The infrastructure of airport-airplane requirements includes runway/taxiway dimensional trends, taxiway-to-taxiway separation, holding space, noise reduction, recovery of disabled aircraft, and fire and rescue operations. Emphasis is placed on the necessity of including the airport operations area as part in a public transportation system. G.G.

N71-22487# Committee on Aeronautical and Space Sciences (U.S. Senate).
NOMINATION ON THE NOMINATION OF DR. JAMES C. FLETCHER TO BE ADMINISTRATOR OF THE NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
Washington GPO 1971 25 p refs Hearing before Comm. on Aeron. and Space Sci., 92d Congr., 1st Sess., 10 Mar. 1971
Avail: Comm. on Aeron. and Space Sci.

Testimony in support of the nominee as Administrator of NASA is given, including a brief history of past achievements, honors, and qualifications. The candidate's views on present and future plans for NASA programs are also presented. J.A.M.

N71-22526*# National Aeronautics and Space Administration, Washington, D.C.
A REPORT ON THE CLOSING OF THE NASA ELECTRONICS RESEARCH CENTER, CAMBRIDGE, MASSACHUSETTS
Boyd C. Myers 1 Oct. 1970 284 p refs
(NASA-TM-X-67054) Avail: NTIS CSCL 14B

The procedures for closing a government facility are elucidated, using as an example the NASA Electronics Research Center. The closing activities are listed in chronological and categorical order, including public affairs, legislative affairs, loans to universities, equipment and real estate disposal, and financial management. The varied effects on personnel and research programs are also related. J.A.M.

N71-22575*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
DATA EDITING
June E. Thompson Washington Apr. 1971 13 p refs
(NASA-TM-X-2264; E-6060) Avail: NTIS CSCL 09D

An editing system has been developed for a large general time sharing computer. A dynamic editing display technique and a static microfilm method are described. These editing techniques have been used to reduce the cost of processing large volumes of research data and of eliminating redundant data. They have also been helpful to the engineer in detecting faulty instrumentation and defining processing instructions. Author

N71-22732# Joint Publications Research Service, Washington, D.C.
METHOD OF CALCULATION OF EXPENDITURES FOR CERTAIN METHODS OF RECORDING EXPERIMENTAL DATA
V. D. Akulov et al *In its* Mechanization and Automation of Control Systems 29 Mar. 1971 p 48–53 refs

Avail: NTIS

Cost effectiveness in recording experimental data is considered. The relative values of three data recording techniques are compared: (1) magnetoelectric oscillographic recording on photographic film with chemical development, (2) magnetoelectric oscillographic recording on paper without chemical development, and (3) strip chart recording. E.C.

N71-22790*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
SFOF CONFIGURATION CONTROL
K. R. Carter *In its* The Deep Space Network, Vol. 1 15 Feb. 1971 p 122–123
Avail: NTIS CSCL 14B

The need for and design of a Space Flight Operations Facility Configuration Control System based on the highly dynamic nature of the facility and the unique, critical requirements levied upon it by multiple and simultaneous flight projects supported by various functional organizations is described. Author

N71-23251*# State Univ. of New York at Buffalo.
FEDERAL PROCUREMENT: A STUDY OF SOME PERTINENT PROPERTIES, POLICIES AND PRACTICES OF A GROUP OF BUSINESS ORGANIZATIONS Final Report
Raymond G. Hunt, Ira S. Rubin, and Franklyn A. Perry, Jr. Jul. 1970 118 p refs
(Grant NGR-33-015-061)
(NASA-CR-117899) Avail: NTIS CSCL 05A

The results are presented of a questionnaire survey of 27 industrial organizations designed to: (1) illuminate selected perceptions, policies and procedures regarding government contracting; (2) describe general business objectives and managerial methods; and (3) yield assessments of how the surveyed firms

perceived their present and future business prospects. A measure of special attention was accorded to exploring policies and procedures relating to contractual incentives and their role in program planning and performance. Author

N71-23310*# Scientific Translation Service, Santa Barbara, Calif.
SOCIAL FACTORS IN CONTROLLING THE DEVELOPMENT OF SCIENTIFIC TEAMS [SOTSIALYNE FAKTORY UPRAVLENIIA RAZVITIEM NAUCHNYKH KOLLEKTIVOV]
Yu. V. Poshekhonov Washington NASA Apr. 1971 15 p refs Transl. into ENGLISH from publ. "Naukovedeniye, Prognozirovaniye, Informatika; Vsesoyuznyy Simpozium, 2ogo Materialy Kiev, 6 – 9 December 1967' Kiev, Naukova Dumka, 1970 p 166-175
(Contract NASw-2035)
(NASA-TT-F-13552) Avail: NTIS CSCL 05K

An experimental sociological investigation was made of labor organization and control structure in scientific research institutes that deal with the solution of current and expected practical problems for different branches of industry. These scientific teams are concerned with tasks that are intermediate between theoretical research at universities and production and manufacturing in plants. A survey covering a total of 640 persons was made in five institutes working for different branches of industry. The correspondents consisted of 148 management personnel, 156 senior scientists, 97 junior scientists, 169 engineers, and 70 designers. The goal of the survey was to study the social aspects of labor organization and management. The results are discussed in terms of the correspondence between the assigned tasks and the percentage of allotted time actually spent by various personnel in performing these tasks. Author

N71-23502# National Aerospace Lab., Amsterdam (Netherlands).
INTRODUCTORY PAPER
H. A. Stolk *In* AGARD Sci. and Tech. Inform Feb. 1971 3 p refs
Avail: NTIS

Information systems, and their histories, are briefly discussed along with subjects to be covered in the current lecture series. In this series the product considered was the technological information that exists in the form of printed words, graphs, tables, pictures, specifications, etc., and means by which this information can be transferred. Also discussed in the introductory speech is the transfer of technology and its management. A.L.

N71-23504*# National Aeronautics and Space Administration. Washington, D.C.
USER NEEDS
John F. Stearns *In* AGARD Sci. and Tech. Inform. Feb. 1971 6 p
(NASA-TM-X-67142) Avail: NTIS CSCL 05B

The question of user needs is examined from three viewpoints: what has been and is being done to determine actual user needs; the kinds of services now evolving to satisfy these needs; and possible further steps to improve both definition and satisfaction of these needs. Attention is given to general areas of bibliographic services, and to specific opportunities inherent in these services for the application of techniques and procedures that may provide potential users with easier access to a wider range of informational alternatives. Author

N71-23507# Battelle Memorial Inst., Columbus, Ohio.
CONCEPT, MISSION, AND OPERATION OF SCIENTIFIC AND TECHNICAL INFORMATION ANALYSIS CENTERS
G. S. Simpson, Jr. and J. W. Murdock *In* AGARD Sci. and Tech. Inform. Feb. 1971 14 p
Avail: NTIS

Information Analysis Centers (IAC's) are discussed in three parts: concept, mission, and operation. Since there is an array of existing scientific and technical information services varying from the conventional library, through special libraries and document depots to IAC's, the presentation considers what an IAC is, how it relates to other information services, and its fundamental concept. The mission of an IAC is considered in the light of its users, or *peer group, how unpublished information is obtained and used, and* how feedback helps the IAC achieve its mission. Two non-government supported IAC are described along with one government center. Also considered are operational aspects (administration and management) of an IAC. Based on close contact with over a dozen operating IAC's, actual experiences pertaining to the recruitment and utilization of competent research scientists and engineers in information analysis work, advantages of working in an IAC environment, key problems in day-to-day operation, and the ever present problem of money are discussed. Author

N71-23628# Commerce Dept., Washington, D.C.
INNOVATION IN MEASUREMENT
Myron Tribus In NBS *Innovative Metrology: Key to Progr.* Mar. 1971 p 9–10
Avail: SOD $1.50

Responsibilities and management decisions of a progressive standards laboratory are described. It is felt that a first-rate laboratory must be able to give a customer an unambiguous statement of what the laboratory does for him, and to meet the requirements both of utmost accuracy in calibration and also of lesser accuracy with greater speed in operation. An understanding of the tradeoffs between cost and accuracy, between cost and turnaround time, and of the customer is essential. The role played by the Measurement Analysis Program in advanced calibration techniques is discussed. N.E.N.

N71-23636# Westinghouse Electric Corp., Baltimore, Md. Defense and Space Center.
COST VISIBILITY EXCHANGE PROGRAM: A NEW APPROACH TO COOPERATIVE SAVINGS
R. J. Barra *In* NBS Innovative Metrology: Key to Progr. Mar. 1971 p 51–56
Avail: SOD $1.50

A preliminary survey by the Calibration Systems Management Committee indicates 600,000 manhours per year spent on 9 types of instruments, including oscilloscopes. Member organizations are asked to contribute cost data with the objective of saving one million dollars in calibration and maintenance costs by 1972. Author

N71-23641# *National Bureau of Standards, Washington, D.C.*
BREAKTHROUGH TECHNIQUES FOR METROLOGY WORK
Lloyd B. Wilson *In its* Innovative Metrology: Key to Progr. Mar. 1971 p 85–88 refs
Avail: SOD $1.50

Metrology work involves the conflicting and diametrically opposed problems of control versus breakthrough. Controls are vital to assure accuracy and reliability. However, breakthroughs are necessary to provide improved accuracies, ranges, and types of measurements. The dichotomy of this situation comes principally from the differences in attitudes involved. Ideally, control and breakthrough should be carried out by two different types of people because of these differences. Breakthrough techniques coupled

with proper attitudes and a systematic method for establishing objectives and evaluating alternatives, provide a powerful set of new tools for improvement. Examples are given showing the possibilities for applying these tools to reduce cost and provide needed measurement and calibration services. Author

N71-23643# General Dynamics/Convair, San Diego, Calif. Standards and Calibration Labs.

THE IMPORTANCE OF VISIBILITY AND CONTROL IN LABORATORY MANAGEMENT SYSTEMS

John L. King *In* NBS Innovative Metrology: Key to Progr. Mar. 1971 p 95–98

Avail: SOD $1.50

A computerized test equipment control system and the responsibilities of the engineering section in charge of the control system are described. The computerized system has inputs of all parameters of test equipment cost, control, and life-history, and the outputs contain all information required for intelligent decision-rule formulation or equipment control. The system permits a close view of models in use, preferred, and in storage status. The problem of calibrating intervals is also discussed, and the test equipment is divided into critical and regular application categories. N.E.N.

N71-23741*# National Aeronautics and Space Administration. Washington, D.C.

REMARKS OF JAMES E. DENNY BEFORE THE STUDY GROUP ON LEGAL REMEDIES, COMMISSION ON GOVERNMENT PROCUREMENT

James E. Denny [1971] 22 p refs Conf. held at Washington, D.C., 17 Feb. 1971

(NASA-TM-X-67143) Avail: NTIS CSCL 05A

Comments concerning the legalities of patent infringements resulting from current government procurement policies are reported with some suggested remedies for providing protection of the patent rights. It is recommended that each government agency have full authority to administratively settle claims of patent infringement before suit is brought against the government, and each agency should have authority for permitting the patent owner to proceed directly against the infringing contractor. F.O.S.

N71-23849*# General Electric Co., Philadelphia, Pa. Missile and Space Div.

STUDY OF APPLICATIONS OF BIOSPACE TECHNOLOGY TO PATIENT MONITORING SYSTEMS: PROGRAM PLANS AND BUDGETARY COST ESTIMATES Final Report Supplement

17 Feb. 1971 155 p refs

(Contract NASw-2073)

(NASA-CR-118035) Avail: NTIS CSCL 06B

The application of space biology techniques to the development of patient monitoring systems is discussed. Four basic physiological monitoring modules are considered for: (1) cardiac, (2) cardiovascular, (3) pulmonary, and (4) body chemistry systems. Each modular configuration includes computational capability which is provided by a mini computer. Remote displays at bedside and nurse's station provide capability for monitoring the patient's condition. Author

N71-24060*# American Inst. of Astronautics and Aeronautics, Los Angeles, Calif.

TECHNOLOGY AND THE PUBLIC SECTOR

Victor Magistrale Jul. 1970 88 p

(NASA Order H-800D6A)

(NASA-CR-61344) Avail: NTIS CSCL 05B

The impact of technology on social problems is a matter of increasing concern to the general public as well as the scientific, engineering, and educational communities. A study is presented on the complex nature of interfaces which exist among technologists, public administrators, and people in need of improved systems and services. Author

N71-24108# RAND Corp., Santa Monica, Calif.

AEROSPACE PRICE INDEXES. PROJECT RAND

H. G. Campbell Dec. 1970 36 p refs

(Contract F44620-67-C-0045)

(AD-718089; R-568-PR) Avail: NTIS CSCL 5/3

An analysis of publications prepared by the Bureau of Labor Statistics relating to price indexes leads to a criticism of the sufficiency of data on aerospace items, with the exception of hourly earnings information. Overhead is an important cost component of major purchased materials and finished production items, but it has not been treated in any regularly published report. Thus any index purporting to measure price changes in aerospace products may be questioned. Simple and convenient indexes, including those presented here, are no substitute for reasonably thorough analysis and should be used only if such analysis cannot be accomplished. GRA

N71-24180*# General Electric Co., Daytona Beach, Fla. Space Div.

STUDY OF AEROSPACE STRUCTURAL MANUFACTURING CONCEPTS. VOLUME 1: SUMMARY Final Report

15 Mar. 1971 32 p refs

(Contract NAS2-5857)

(NASA-CR-114281) Avail: NTIS CSCL 13H

The results of a study of aerospace manufacturing concepts are summarized. Detailed manfacturing line definitions are established for two production rates (2 per year and 20 per year) for each of three manufacturing lines spanning state-of-the-art and improved and advanced manufacturing technologies. A computerized simulation model (MANCAN) was used for accumulating costs for assessing the impact of variations and interactions of factors on manufacturing cost. Cost distributions for the nominal cases show the predominant importance of facilities and tooling on manufacturing costs. Facilities and tooling costs ranged from 42 percent to 81.2 percent of the total, far outshadowing recurring costs such as materials and labor. The largest potential area for cost reductions lies in those factors which reduce facility and tooling expense. The impact of the facility and tooling costs on the unit production costs are illustrated showing the marked decrease if these costs are written off against increased quantity. Coupling high quantity production with advantageous factors reduces unit production costs by approximately two orders of magnitude. Technology developments aimed at reducing future aerospace structural manufacturing costs can be focused best on simple, rugged structures that can be produced in quantity in inexpensive facilities. Author

N71-24181*# General Electric Co., Daytona Beach, Fla. Space Div.

STUDY OF AEROSPACE STRUCTURAL MANUFACTURING CONCEPTS. VOLUME 2: MANUFACTURING LINE MODEL DESCRIPTIONS, ANALYSES, AND RESULTS Final Report

15 Mar. 1971 216 p refs
(Contract NAS2-5857)
(NASA-CR-114282) Avail: NTIS CSCL 13H

The economic examination is presented of the technology areas pertinent to conventional (aluminum) aerospace manufacturing. Two representative structures are used in a systems analysis of the impact of technology and program factors on manufacturing. The initial manufacturing lines are defined using today's state-of-the-art procedures and costs. Facilities, tooling, premanufacturing operations, materials, manufacturing and quality control labor are indicated. Improvements in overall operations and manufacturing technology are introduced to define improved and advanced manufacturing lines. A computer model was developed for accumulating and manipulating manufacturing data and costs and is described in detail. Information related to the manufacturing technologies has been derived primarily from Government and industry sources typified by Saturn/Apollo structural manufacturing experience. Results for representative structures indicate that the recurring part of the manufacturing processes cost is not the major portion of the total manufacturing cost. In general it was shown that for the manufacture of a propellant tank the facilities, tooling and other nonrecurring costs represent from one-half to three-fourths of the total manufacturing cost. No single factor has a more significant impact on cost than the quantity of like elements produced. Author

N71-24182*# General Electric Co., Daytona Beach, Fla. Space Div.
STUDY OF AEROSPACE STRUCTURAL MANUFACTURING CONCEPTS. VOLUME 3: SURVEY OF MANUFACTURING TECHNIQUES AND FACTORS Final Report
15 Mar. 1971 395 p refs
(Contract NAS2-5857)
(NASA-CR-114283) Avail: NTIS HC $6.00/MF $0.95 CSCL 13H

The results of a survey of manufacturing techniques are presented as the initial part of the study of aerospace structural manufacturing concepts. The work performed is devoted primarily to examination of the technology areas pertinent to conventional (aluminum) aerospace manufacturing and to the impact of factors on the technology areas. Specific observations as well as the qualitative impact of factors on manufacturing are also reviewed. Factors and plant facilities influencing these technologies were identified from reviewing these areas with aerospace contractors as well as from internal manufacturing consultants. Interrelationships between these areas are illustrated. The five major areas of investigation and primary sources of data in these areas are summarized. Information related to the manufacturing technologies was derived primarily from Government and industry sources typified by Saturn/Apollo structural manufacturing experience. Author

N71-24203 Purdue Univ., Lafayette, Ind.
ON PRINCIPLES OF TECHNICAL DIRECTION FOR ASTRONAUTICAL RESEARCH AND DEVELOPMENT PROJECTS OF HIGH NATIONAL PRIORITY
Thomas Cardwell Brown, Jr. (Ph.D. Thesis) 1969 77 p
Avail: Univ. Microfilms: HC $34.70/Microfilm $9.75 Order No. 70-8866

The concepts used by the Federal Systems program office to formulate the technical direction strategy for urgent astronautical projects of high national priority were explored. A version of the principles of war was used as an exploratory set to search for dominant concepts in sixty interviews with program directors and key executives in DOD (Army, Navy, Air Force), AEC, NASA, and three contractors (Aerospace Corporation, Bell Telephone Laboratories, and Thompson-Ramo Wooldridge Systems Laboratories). The interview data was the inductive source for candidate concepts. The resulting concepts were developed and modified by the relevant literature and when appropriate confirmed in four different sets of system program offices. Dissert. Abstr.

N71-24218# Academy of Sciences (USSR), Moscow.
DESIGN PROBLEMS IN INDUSTRY AUTOMATIC CONTROL SYSTEMS
N. P. Fedorenko, ed. 1970 256 p refs In RUSSIAN
Avail: NTIS

Four basic issues in the generation of an industry-wide automatic control system are considered: (1) economic factors, (2) mathematical provisions, (3) information system aspects, and (4) engineering factors. Classifying and grouping industries in accordance with common technological and economic organizations is discussed along with control mechanisms, optimum methods for plan calculations, procedures for operations decision making, and processes for formulating accounting and reporting indicators. Transl. by E.C.

N71-24307# Committee on Science and Astronautics (U.S. House).
AUTHORIZING APPROPRIATIONS TO THE NATIONAL AERONAUTICS AND SPACE ADMINISTRATION Report, Together With Additional and Separate Views, To Accompany H.R. 7109
Miller Washington GPO 1971 176 p refs Presented to the Comm. of the Whole House on the State of the Union, 92d Congr., 1st Sess., 22 Apr. 1971
(Rept-92-143) Avail: US Capitol, House Document Room

Recommendations from the House of Representatives subcommittee authorizing appropriations to the National Aeronautics and Space Administration for fiscal year 1972 are reported. Programs outlined include: research and development, construction of facilities, and research and program management. E.M.C.

N71-24463# Aeroplane and Armament Experimental Establishment, Boscombe Down (England). Performance Div.
A DISCUSSION ON UNITS, UNIT SYMBOLS AND ABBREVIATIONS FOR USE AT A AND AEE
Kathleen Richardson 9 Sep. 1970 29 p refs
(AAEE-TECH-425) Avail: NTIS

The association of A and AEE work with operational considerations will necessitate the parallel use of traditional and metric units for some years to come and not all metric engineering information will be in pure SI units. To provide guidance on correct use, the relationships between SI units, non-SI units likely to be used commonly in engineering applications and current international operational units are reviewed. The presentation of numerical values is discussed. Rules to promote uniformity in the formulation of abbreviations at A and AEE are given. Author (ESRO)

N71-24716*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
MAPS - A COMPUTERIZED MANAGEMENT ANALYSIS AND PLANNING SYSTEM
Donald R. Packe and Gil A. Raffaeli Washington May 1971 60 p
(NASA-TN-D-6189; E-5979) Avail: NTIS CSCL 09B

MAPS provides managers of large technical projects with a fast and economical information system for planning and

controlling their projects. The program in the simplest terms is a computerized bar-chart schedule-reporting system in which project elements at all levels can be listed. MAPS has been specifically designed for planning and scheduling engineering project work; however, its flexible format capability permits a variety of other uses such as parts lists, configuration control, drawing lists, manpower and budget planning, and organization charts. Author

N71-24751# Committee on Science and Astronautics (U. S. House).
INTERNATIONAL SCIENCE POLICY Conference Papers
Washington GPO Feb. 1971 166 p refs A compilation of papers prepared for the 12th Meeting of the Panel on Sci. and Technol., 1971, presented by Comm. on Sci. and Technol. to the US Congr., Feb. 1971 Supplement to the Proc. of the Panel
Avail: SOD $0.75

CONTENTS:

1. INTERNATIONAL COOPERATION IN THE ENVIRONMENTAL SCIENCES W. O. Roberts (Univ. Corp. for Atmospheric Res.) p 11-33

2. INTERNATIONAL COOPERATION IN THE PHYSICAL SCIENCES A. Salam (Intern. Centre for Theoret. Phys.) p 35-49

3. NEW MECHANISMS FOR SCIENTIFIC COOPERATION IN THE FUTURE V. A. Ambartsumian (Intern. Council of Sci. Unions, Rome, Italy) (Acad. of Sci. of the Armenian SSR) p 51-60

4. SCIENCE, TECHNOLOGY, THE MILITARY AND ARMS CONTROL F. A. Long (Cornell Univ., Ithaca, N.Y.) p 61-72

5. NATIONAL SCIENCE POLICY: PRELUDE TO GLOBAL COOPERATION E. Q. Daddario (Gulf and Western Precision Eng. Co., Manchester, Conn.) p 73-80

6. ADMINISTRATIVE REQUIREMENTS FOR ADVANCING INTERNATIONAL SCIENCE POLICY J. E. Webb (Natl. Acad. of Public Admin., Washington, D.C.) p 81-90

7. INTERNATIONAL COOPERATION IN THE SOCIAL AND LIFE SCIENCES T. R. Odhiambo (Nairobi Univ., Kenya) p 91-109

8. THE LEGISLATIVE ROLE IN SCIENCE POLICY A. Grosart (Steering Committee on Sci. Policy) p 111-121 refs

9. SCIENCE, TECHNOLOGY AND THE DEVELOPING COUNTRIES H. S. Brown (Natl. Acad. of Sci. Natl. Res. Council, Wash., D.C.) p 123-132

10. THE ROLE OF SCIENCE POLICY IN SOLVING SOCIAL PROBLEMS. THE UNBALANCED PROGRESS OF PROGRESS S. B. Linder (Handelshoegskolan 1, Stockholm, Sweden) p 133-141

11. INTERNATIONAL SCIENCE POLICY IN THE MARINE ENVIRONMENT J. Y. Cousteau (Centre d'Etudes Marines Avancees, Marseilles, France) p 143-148

12. POTENTIAL CONSEQUENCES OF EXPERIMENTATION WITH HUMAN EGGS J. D. Watson (Harvard Univ., Cambridge, Mass.) p 149-161 refs

N71-24752# University Corp. for Atmospheric Research, Boulder, Colo.
INTERNATIONAL COOPERATION IN THE ENVIRONMENTAL SCIENCES
Walter Orr Roberts *In* Comm. on Sci. and Astronaut. (U. S. House) Intern. Sci. Policy Feb. 1971 p 11-33
Avail: SOD $0.75

Environmental pollution problems of national and world aspects are outlined and international cooperative engineering requirements for global atmospheric research and other scientific and technological problems caused by man's intervention in the ecological balance of the biosphere are discussed. Emphasis is placed on: (1) increase in atmospheric carbon dioxide and dust contents and the resulting reduction in ultraviolet light; (2) land irrigation and cultivating effects on the microclimate; (3) greater rainfall volumes over cities caused by urban developments that include wind effects of high buildings and release of man-made freezing and condensation-nuclei into the atmosphere; and (4) possible climatic effects of SST deployments on a vast scale. The growing domains of weather modification and international environmental laws indicate increased cooperative efforts. G.G.

N71-24753# International Centre for Theoretical Physics, Trieste (Italy).
INTERNATIONAL COOPERATION IN THE PHYSICAL SCIENCES
Abdus Salam *In* Comm. on Sci. and Astronaut. (U. S. House) Intern. Sci. Policy Feb. 1971 p 35-49
Avail: SOD $0.75

The creation of an International Science Foundation for coordinating physical research efforts by pooling costs, personnel, equipment, and technology is advocated. Group planning and the necessary international cooperation funds are imperative for implementing worldwide collaboration in physical sciences to perform the next great syntheses of fundamental sciences: gravity, nuclear physics, and electromagnetism as represented in the F-meson, a particle with identical quantum numbers as the graviton that transmits a nuclear force identical with gravity, except that it is much stronger. G.G.

N71-24754# International Council of Scientific Unions, Rome (Italy).
NEW MECHANISMS FOR SCIENTIFIC COOPERATION IN THE FUTURE
Viktor A. Ambartsumian (Acad. of Sci. of the Armenian SSR) *In* Comm. on Sci. and Astronaut (U. S. House) Intern. Sci. Policy Feb. 1971 p 51-60
Avail: SOD $0.75

The problems of international scientific cooperation are a progressive factor in the life of humanity and should not be subjected to political tensions, and racial or national discriminations. Good relations between scientists taking part in various programs with frequent discussion meetings help to bring understanding among nations and the peoples of the world. The creation of a world system of scientific information is strongly recommended and examples of its application are projected. G.G.

N71-24755# Cornell Univ., Ithaca, N.Y. Program on Science, Technology and Society.
SCIENCE, TECHNOLOGY, THE MILITARY AND ARMS CONTROL
Franklin A. Long *In* Comm. on Sci. and Astronaut. (U. S. House) Intern. Sci. Policy Feb. 1971 p 61-72
Avail: SOD $0.75

Increased sophistication, quantity, and effectiveness of military technology requires new scientific efforts to effectively control this burgeoning industry. Evaluation of the political and social impacts of modern military systems, considered by the concept of relative risks, leads to an exploration of alternatives to military systems and war, with special emphasis on arms control and disarmament along

with peace keeping programs for the maintainance of stability. International scientists and engineers are urged to play an explanatory and tutorial role in their own countries so that the nations concerned have a clear understanding of the problems and opportunities involved. The development of a Joint Congressional Committee for National Security is proposed that studies nonmilitary alternatives as well as international needs and goals. G.G.

N71-24756# Gulf and Western Precision Engineering Co., Manchester, Conn.
NATIONAL SCIENCE POLICY: PRELUDE TO GLOBAL COOPERATION
Emilio Q. Daddario *In* Comm. on Sci. and Astronaut. (U. S. House) Intern. Sci. Policy Feb. 1971 p 73–80

Avail: SOD $0.75

The question of how national science and technology can be best employed for the benefit of all mankind is considered and new approaches for broader international scientific and political cooperation are outlined. Aid to developing countries brings security and prevents resource exploitation; administration of international standards in global problems promotes health and well being. The development of an international science policy framework that breaks down traditional disciplinary barriers and uses new mechanisms for the transfer of research results into global applications is imperative. Global scientific cooperation promises to reduce the increasing alienation of mankind and provides means for holding things together since lack of confidence kills a civilization. G.G.

N71-24757# National Academy of Public Administration, Washington, D.C.
ADMINISTRATIVE REQUIREMENTS FOR ADVANCING INTERNATIONAL SCIENCE POLICY
James E. Webb *In* Comm. on Sci. and Astronaut. (U. S. House) Intern. Sci. Policy Feb. 1971 p 81–90
Avail: SOD $0.75

A science policy effective as a part of an international aspiration must offer benefits for those nations which adopt and follow it. A system of international relations in the scientific sphere requires organization and administration for implementing cooperation. G.G.

N71-24758# Nairobi Univ. (Kenya). Faculty of Agriculture.
INTERNATIONAL COOPERATION IN THE SOCIAL AND LIFE SCIENCES
Thomas R. Odhiambo *In* Comm. on Sci. and Astronaut. (U. S. House) Intern. Sci. Policy Feb. 1971 p 91–109

Avail: SOD $0.75

International social and life science efforts are required to close the gap between technologically advanced nations and the developing countries. Mechanisms for international science cooperation constitute printed matter, scientific meetings and conferences, post-doctoral fellowships, and patenting and selling of knowhow. Broad objectives and their implications for maximizing international scientific cooperation in research centers are discussed and general outlines of the organization and basic research projects of the International Center of Insect Physiology and Ecology located in Nairobi, Kenya, are given. G.G.

N71-24759# Steering Committee on Science Policy (Canadian Senate), Ottawa.
THE LEGISLATIVE ROLE IN SCIENCE POLICY
Allister Grosart *In* Comm. on Sci. and Astronaut. (U. S. House) Intern. Sci. Policy Feb. 1971 p 111–121 refs

Avail: SOD $0.75

The science policies of various countries are briefly described and the responsibilities of elected representatives in both funding and performance of research and development work are discussed. The application of social, economic, and technological criteria to overall national and international scientific productivity requires the involvement of qualified parliamentarians who can assess the value of a scientific program knowingly. G.G.

N71-24760# National Academy of Sciences—National Research Council, Washington, D.C.
SCIENCE, TECHNOLOGY AND THE DEVELOPING COUNTRIES
Harrison S. Brown *In* Comm. on Sci. and Astronaut. (U. S. House) Intern. Sci. Policy Feb. 1971 p 123–132

Avail: SOD $0.75

Rapid economic development of the poor countries is essential and can be accelerated by expanded transfer of capital from the rich countries. A major increase in capital flow can only be effectively absorbed into a developing economy if there are enough trained human resources, and an adequate organizational structure in existence that permits decisions to be transformed effectively into actions. The channeling of capital assistance through international agencies is advocated and the creation of an International Development Institute is proposed. G.G.

N71-24761# Handelshoegskolan i Stockholm (Sweden).
THE ROLE OF SCIENCE POLICY IN SOLVING SOCIAL PROBLEMS. THE UNBALANCED PROGRESS OF PROGRESS
Staffan Burenstam Linder *In* Comm. on Sci. and Astronaut. (U.S. House) Intern. Sci. Policy Feb. 1971 p 133–141

Avail: SOD $0.75

Adoption of a cautious, but well financed program of technological development is advocated in order to minimize the unbalancing effects between the progress of science and man by providing: (1) some moral advancement; (2) increased capacity to adjust to the demands of the new technology; (3) reallocation of time to stimulate pleasure activities with bigger injections of consumption goods; (4) solutions to environmental problems that cause serious social erosions; and (5) even spread of the benefits of modern science and technology. A definite science policy is required to solve the problems that the application of science has caused. G.G.

N71-24762# Centre d'Etudes Marines Avancees, Marseilles (France).
INTERNATIONAL SCIENCE POLICY IN THE MARINE ENVIRONMENT
Jacques Yves Cousteau *In* Comm. on Sci. and Astronaut. (U. S. House) Intern. Sci. Policy Feb. 1971 p 143–148

Avail: SOD $0.75

The decrease of population and vitality of the ocean by more than 40% during the last 20 years is linked to evidence that all atmospheric-, land-, or sea pollution ends up in the oceans.

Pollution elimination requires isolation of all toxic products from effluents in the water cycle, reduction of industrial development; and control of the populations. National and international actions by the main polluters, the industrial nations, are projected to formulate and enforce global antipollution regulations. G.G.

N71-24801*# Battelle Memorial Inst., Columbus, Ohio.
A SURVEY OF AEROSPACE EMPLOYEES AFFECTED BY REDUCTIONS IN NASA CONTRACTS Final Report
20 May 1971 119 p refs
(Contract NASw-2176)
(NASA-CR-118374) Avail: NTIS CSCL 05K

The results of a survey of aerospace employees affected by reductions in NASA contracts are presented. The study was primarily directed toward data gathering rather than analysis. Time considerations dictated an early summarization of the basic survey results in sufficient detail to make the data available to various potential users. As a consequence, the report is heavily detailed in the presentation of the statistics gathered through the survey. Author

N71-25227# Booz-Allen Applied Research, Inc., Bethesda, Md.
A GENERALIZED LITE CYCLE COST MODEL FOR ELECTRONIC EQUIPMENT
10 Mar. 1970 158 p
(Contract DAAB07-69-D-5041)
(AD-719709) Avail: NTIS CSCL 5/1

The purpose of the study is to develop a generalized life cycle cost model that can be employed by analysts of the Systems/Cost Analysis Office (S/CAO) as an aid in the development of cost estimates for electronic equipment. The model developed has a structure of cost aggregation that lends itself to the data format in which information is available and concurs with the anticipated data collection format to be used by the Cost Information Division. The Life Cycle Cost Handbook included in this document was developed to provide a consistent set of definitions for cost information to be collected. It also contains references to data sources and CERs identified in the early literature review. The method of data collection developed and the computerized model assure that studies using the model and the handbook will produce estimates predicated upon a consistent approach that is fully documented. This will permit the analyst to expend the bulk of his effort in data collection and analysis. Author (GRA)

N71-25472*# National Aeronautics and Space Administration, Goddard Space Flight Center, Greenbelt, Md.
GODDARD RESEARCH AND ENGINEERING MANAGEMENT EXERCISE (GREMEX)
Richard F. Baker, ed. Washington May 1971 18 p
(NASA-TN-D-6347; G-1014) Avail: NTIS CSCL 05A

Goddard Research and Engineering Management Exercise (GREMEX) is a computer assisted management simulation exercise. Participants (individuals or teams) learn to become more effective managers by manipulating factors of time, cost, and technical performance in a research and development project environment. Participants must deal with human relations factors and random accidents of nature as well. GREMEX may be purchased at a nominal cost for non-NASA use. Little or no modification is required for many career development requirements. Author

N71-25572# Committee on Science and Astronautics (U. S. House).
TECHNICAL INFORMATION FOR CONGRESS From Subcommittee on Science, Research, and Development
Washington GPO 15 Apr. 1971 868 p refs Rept. presented to Comm. on Sci. and Astronaut., 92d Congr., 1st Sess., 15 Apr. 1971 Prepared by the Library of Congr. Sci. Policy Res. Div. Revised *Its* Serial A
Avail: SOD $3.50

The results of a study to improve the interaction of science and politics are presented. The general aim of the study is to develop an understanding of the process of drawing from the scientific community information and guidance needed by the Congress in legislating on issues with a substantial technical content. Lessons learned from previous legislation involving highly scientific subjects are presented to point out strengths and weaknesses of present relationships between the Congress and the scientific community. P.N.F.

N71-25761*# National Aeronautics and Space Administration, Washington, D.C.
COMMUTERS, STAY HOME AIAA Paper No. 71-490
Gifford A. Young 1971 11 p refs Presented at Urban Technol. Conf., New York, 24–26 May 1971; sponsored by AIAA and Astronaut. Intern. City Management Assoc., Natl. League of Cities, and US Conf. of Mayors, Inc.
(NASA-TM-X-67243) Avail: NTIS CSCL 05K

Commuting imposes serious cost, time, and social burdens on individuals and society. It should not be considered primarily as a transportation problem but as a part of a complex economic and behavioral system in which the functions and structure of the work location and the commuter's residence are of greater import. A potential alternative to routine commuting is the concept of remote work by which a worker conducts office-type activities in his house or apartment or through a neighborhood work and telecommunications center, yet travels to his employer's office at appropriate times for orientation and motivation. A development program to demonstrate the effectiveness of remote work, evaluate its impact on economic and social patterns, and promote phased implementation is proposed. Author

N71-26116# Royal Aircraft Establishment, Farnborough (England).
CABTRACK STUDIES: ASSESSMENT OF AUTOTAXI URBAN TRANSPORT SYSTEMS
Jan. 1969 207 p refs
(RAE-TR-68287-Pt-2) Copyright. Avail: NTIS

CONTENTS:

1. SUMMARY OF EXISTING PROPOSALS A. F. Hammond p 5–24 refs

2. SOME EXPERIMENTS TO DETERMINE ACCELERATION LIMITS FOR PASSENGER COMFORT D. I. Paddison p 25–26 refs

3. THE INFLUENCE OF ACCELERATION LIMITS ON SPACE NEEDED TO PERFORM MANOEUVRES D. I. Paddison p 27–40

4. TRAVEL FROM B.R. STATIONS INTO CENTRAL LONDON DURING THE MORNING RUSH HOUR M. G. Langdon p 41–43

5. PEAK AND 24-HOUR DEMAND MATRICES FOR CENTRAL LONDON NETWORKS D. Catherall p 45–60 refs

6. ROUTE FINDING THROUGH RECTANGULAR NETWORKS D. Catherall p 61–64

7. DISTANCES WALKED TO CABTRACK STATIONS ON A SQUARE NETWORK D. Catherall p 65–66

8. TRACK/AIR-LINE DISTANCE RATIOS FOR RECTANGULAR MESHES D. Catherall and J. M. Clark p 67–70

9. JOURNEY TIMES FOR VARIOUS TRAVEL MODES M. G. Langdon and J. M. Clark p 71–78 refs

10. PROBABLE QUEUE LENGTHS FOR MERGING EXAMPLE OF SECTION 8.2.4.(c) D. I. Paddison p 79–81

11. CABTRIP PLANNING BY CENTRAL COMPUTER D.Catherall p 83–86

12. SURVEY OF HARDWARE FOR CONTROL A. F. Hammond p 87–121 refs

13. AERODYNAMIC FORCES ON AUTOCABS K. T. Shaw p 123–128 refs

14. STABILITY OF AUTOCABS K. T. Shaw p 129–136

15. AUTOCAB POWER REQUIREMENTS K. T. Shaw p 137–143 refs

N71-26412*# Miami Univ., Fla. Dept. of Industrial Engineering and Systems Analysis.

THE USE OF GERT IN PLANNING STRATEGIES FOR DEVELOPMENT TYPE PROJECTS

Joseph J. Moder 15 Jun. 1970 68 p refs

(Contract NAS12-2080)

(NASA-CR-118490) Avail: NTIS CSCL 09B

The use of GERT nomenclature to describe a project plan or system operating policy is considered. The advantages of using this approach in system analysis, and ultimately in communication were discussed. The addition of time estimates, cost, resource requirements, branching probabilities, and other parameters associated with the network activities are assessed for a management policy governing the handling of university inventions. The GERT nomenclature was compared with that of the restrictive logic of PERT/CPM and is shown to have more utility. E.H.W.

N71-26451# Bell Aerospace Co., Tucson, Ariz.

REPORT ON THE OPERATIONS OF THE ENVIRONMENTAL DATA COLLECTION AND PROCESSING FACILITY (EDCPF) Progress Report, 1 Oct.–31 Dec. 1970

T. J. Flahie, H. F. Warren, D. M. Carnine, R. F. Dolan, E. W. Smith et al Mar. 1971 53 p

(Contract DAAB07-71-C-0010)

(AD-720592; A70009-739; Rept-69; PR-2) Avail: NTIS CSCL 5/2

A summary of the tasks assigned to the EDCPF is given and the progress and status of these tasks are outlined. The tasks covered are: project management and general support; operation, maintenance, and enhancement of the C-E Environmental Simulation System, the General Retrieval and Display System, and the Data Base Maintenance and Update System; operational support as directed by the ED; frequency management support provided to the ED by the Washington Engineering Group; development of a Management Information and Control System; updating of data base files for the U. S. and opposing forces; development of new C-E environments; and conferences attended by EDCPF personnel. Author (GRA)

N71-26529# Commerce Dept., Washington, D.C. Economic Development Administration.

THE EFFECT OF AIRLINE SERVICE ON MANUFACTURING GROWTH IN CITIES BELOW 40,000 POPULATION

Leonard F. Wheat May 1970 39 p refs

Avail: Issuing Activity

The effect of commercial airlines on the locational calculus of industry is discussed. The hypothesis that cities with air service experience faster manufacturing growth is explored. The principal finding is that, under certain conditions, airline cities grow appreciably faster. Author

N71-26553# Pennsylvania Dept. of Highways, Harrisburg. Bureau of Management Information Systems.

PENNSYLVANIA'S MATERIALS AND EQUIPMENT INVENTORY SYSTEM

George S. Eakin *In* Am. Assoc. of State Highway Offic. Proc. of the Comm. on Computer Technol. Natl. Conf. May 1970 p 67–105

Avail: Issuing Activity

The computerized inventory control system for the highway department of Pennsylvania is described. The computer assumes the responsibility for (1) maintaining stock levels, (2) reordering, (3) monitoring consumption by counties, and (4) providing necessary reporting. The procedures for daily on-line processing of valid warehouse and management analyst transactions are described. Each transaction is saved on a history file which may be used for manual backup in case of computer failure. The inventory control of field stockpiled winter service materials is considered the most difficult aspect of the system. F.O.S.

N71-26554# Wisconsin Dept. of Transportation, Madison.

HIGHWAY NETWORK DATA AND INFORMATION SYSTEM (HNDI)

Gilbert Brumm *In* Am. Assoc. of State Highway Offic. Proc. of the Comm. on Computer Technol. Natl. Conf. May 1970 p 106–145 refs

Avail: Issuing Activity

The highway integrated operation system (IOS) of Wisconsin is presented. It consists of subsystems which include the functions of major decision making, management and technical services. The general concept of the computer system for the IOS is described and is based on processing, storing and displaying data for all public roads in Wisconsin. The input and output processes are discussed along with data flow. F.O.S.

N71-26555# New York State Office of Planning Coordination, Albany. Bureau of Planning Research.

NEW YORK'S PLANNING INFORMATION SYSTEM

Donald Croteau *In* Am. Assoc. of State Highway Offic. Proc. of the Comm. on Computer Technol. Natl. Conf. May 1970 p 146–154

Avail: Issuing Activity

A formal system for the interchange of information among state agencies is discussed for coordinating systems which support program management, planning, budgeting, and involve interagency responsibility for collection, management, and dissemination of data. A multipurpose geographical data base of hierarchical structure is described which is composed of the county inquiry system, the minor civil division profile system, and the plan map and data list processing system. The communication gap between the decision maker and the data processing technician is also discussed. F.O.S.

N71-26814# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

THE NATURE AND FEATURES OF THE SCIENTIFIC-TECHNICAL REVOLUTION

Yu. S. Meleshchenko 6 Jan. 1971 32 p refs Transl. into ENGLISH from Vopr. Filosofii (USSR), v. 22, no. 7, 1968 p 13-24 (AD-720916; FTD-MT-24-232-70) Avail: NTIS CSCL 5/3

Marxist social and material economic bases of the contemporary stage of scientific-technical revolution are examined. The increasing tempo of this revolution with developments in basic and information sciences is discussed in relation to their increasing complexity and the national importance of being able to deal effectively with them and the people involved. Author (GRA)

N71-27009*# Little (Arthur D.), Inc., Cambridge, Mass.
INSTITUTIONAL FACTORS IN CIVIL AVIATION: JOINT DOT-NASA CIVIL AVIATION RESEARCH AND DEVELOPMENT POLICY STUDY Final Report, Jul.-Nov. 1970
Robert C. Fraser Jan. 1971 211 p refs Prepared in part by Simat, Helliesen and Eichner, Inc. for DOT and NASA
(Contract DOT-OS-00083)
(NASA-CR-1807; DOT-TST-10-1) Avail: NTIS CSCL 01B

Institutional factors which are constraining the civil aviation R and D process by which new or improved systems and equipment are developed in response to civil aviation needs are identified. Options to remove or attenuate the constraints are postulated and the advantages and disadvantages of choosing any given option in order to help guide national policy-makers are discussed. Author

N71-27010*# Booz-Allen Applied Research, Inc., Bethesda, Md.
A HISTORICAL STUDY OF THE BENEFITS DERIVED FROM THE APPLICATION OF TECHNICAL ADVANCE TO CIVIL AVIATION. VOLUME 1: SUMMARY REPORT AND APPENDIX A (DETAILED CASE STUDIES): JOINT DOT-NASA CIVIL AVIATION RESEARCH AND DEVELOPMENT POLICY STUDY
Feb. 1971 176 p refs
(Contract DOT-OS-00020)
(NASA-CR-1808; DOT-TST-10-2-Vol-1) Avail: NTIS CSCL 01B

The benefits to the nation resulting from the application of technical advances to civil aviation are determined. The technical advances that occurred since 1945 and the funds expended on aeronautical R and D are identified. The applications of the advances to civil aircraft and flight related systems are determined. Criteria for determining the benefits of civil aviation are established and quantified where possible. A general methodology for relating the advances and the benefits was developed through the impact of technical advances on the performance of the aircraft and flight related systems. Specific methods were used to relate each benefit criterion to advances. These methods were applied to form detailed case studies and, as a result, some modifications to the methods are proposed. Author

N71-27011*# Booz-Allen Applied Research, Inc., Bethesda, Md.
A HISTORICAL STUDY OF THE BENEFITS DERIVED FROM APPLICATION OF TECHNICAL ADVANCES TO CIVIL AVIATION. VOLUME 2: APPENDICES B THRU I
Feb. 1971 416 p refs
(Contract DOT-OS-00020)
(NASA-CR-1809; DOT-TST-10-3-Vol-2) Avail: NTIS HC $6.00/MF $0.95 CSCL 01B

The appendices for a historically based analysis of aeronautical research and development are presented. A summary of aeronautical R and D; the aeronautical R and D effort; capsule histories of research areas; and categories of aircraft in terms of performance are included as well as a discussion of methods used to compute noise and pollution contributions of aeronautical systems. Application of input/output analysis to the determination of gross national product and employment contributions of the air transport and civilian aircraft manufacturing industries; a description of the method developed to relate the gross national product contribution of civil aviation to technical advances; and tabular presentation of selected data representing the benefits of civil aviation are also given. J.M.

N71-27155# Center for Naval Analyses, Arlington, Va. Inst. of Naval Studies.
A FORECAST OF AIR TRAVEL DEMAND AND AIRPORT AND AIRWAY USE IN 1980
Arthur S. Devany and Eleanor H. Garges Jan. 1971 49 p refs
(Contract N00014-68-A-0091)
(AD-720732; Rept-163; INS-72-71) Avail: NTIS CSCL 1/2

The demand for air travel between 581 pairs of domestic cities, which comprise 60 percent of total U.S. domestic air travel, is analyzed and forecast to the year 1980. An assessment of operating economies of new wide-body aircraft and alternative trip times likely to be experienced by future air travelers is made to generate assumptions regarding the structure of future fares and trip times by distance. These assumptions are combined with income and population projections for each city and an estimated demand function to forecast levels of passenger travel between each pair of cities. Airline flights between these pairs of cities are projected under 2 patterns of service that may evolve with the further introduction of wide-body jets into commercial service. Author (GRA)

N71-27477# American Inst. for Research, Pittsburgh, Pa.
DEVELOPMENT OF A TAXONOMY OF HUMAN PERFORMANCE: A REVIEW OF THE THIRD YEAR'S PROGRESS
Edwin A. Fleishman and Robert W. Stephenson Sep. 1970 79 p refs
(Contracts DAHC19-71-C-0004; F44620-67-C-0116; ARPA Order 1032; ARPA Order 1623)
(AD-721217; AIR-R70-11; AIR-726-9/70-TPR3; AFOSR-TR-71-0052; TPR-3) Avail: NTIS CSCL 5/10

The purpose of the taxonomy project is to develop and evaluate systems for describing and classifying tasks which can improve generalization of research results about human performance and to develop a common language for communicating between researchers and individuals who need to apply research to personnel problems. The ability-requirement and task characteristics approaches were used to post-dict mean values of performance measures and relevant factor loadings for a variety of tasks. Author (GRA)

N71-27883# National Bureau of Standards, Washington, D.C. Technical Analysis Div.
PROCEEDINGS OF JOINT MEETING OF GOVERNMENT OPERATIONS RESEARCH USERS AND PRODUCERS
Mary L. Friend, ed. May 1971 168 p Conf. held at Gaithersburg, Md., 5-6 Jun. 1969
(NBS-Sp-347) Avail: SOD $1.25

The Joint Meeting of Government Operations Research Users and Producers was organized to improve the communications among users of operations research within the government, and producers of operations research in public and private organizations. Government agencies were invited to report on exactly what they expect of their OR producers, what they expect to have done with the results, what the purposes and their uses of systems analysis are, and to give a general profile of their in-house work. Universities were invited to report on their capabilities and their desires and

to discuss the OR projects currently in progress on their campuses. This meeting was the second in a planned series of meetings. It aimed at providing more responsive and more adequate studies for improving government agency management and productivity.
Author

N71-28216# Waldo and Edwards, Inc., Redondo Beach, Calif.
THE US COMMUTER AIRLINE INDUSTRY: ITS CURRENT STATUS AND FUTURE OUTLOOK
Nov. 1970 50 p refs
(Contract DOT-W1-71-0871-1)
(AD-718871; Rept-70-109) Avail: NTIS CSCL 5/3

The report is meant to provide an analysis of the current status and future outlook for the air taxi industry from the operational, financial and market standpoint. Financial aspects are emphasized. The purpose is to provide information which will permit FAA to assess the impact of the industry on the aviation facilities system and to determine the extent to which air taxi operations should be taken into account in aviation facilities planning criteria.
Author (GRA)

N71-28272*# George Washington Univ., Washington, D.C. Government Contracts Program.
ANALYSIS OF PROFIT ON INVESTMENT Final Report
John Cibinic 12 Feb. 1971 44 p refs
(Contract NASw-1826)
(NASA-CR-119004) Avail: NTIS CSCL 05C

Profit analysis techniques, including a method of performing return on investment analysis, were developed as a means of training personnel in profit and fee negotiation. Results from the analysis indicate measurement of investment is feasible and negotiators are able to perform investment analysis under operating conditions. Determination of profit through the analysis does not appear to present major problems in overall effect on research and development and hardware contracts. However, with service contracts, it was evident that determination of profit through return on investment is not feasible without major policy changes.
E.H.W.

N71-28277# Massachusetts Inst. of Tech., Cambridge.
THE SUBSTANTIVE USE OF COMPUTERS FOR INTELLECTUAL ACTIVITIES
Robert C. Goldstein Apr. 1971 19 p refs Sponsored in part by ARPA
(Contract N00014-69-A-0276-0002; Proj. MAC)
(AD-721618; MAC-TM-21) Avail: NTIS CSCL 9/2

The paper discusses an on-going research project aimed at developing computer facilities capable of providing substantive aid to a human decision maker concerned with complex, unstructured problems. The rationale for such systems is discussed, followed by an outline of the approach used. Some results of preliminary experiments are also discussed, as well as plans for future activities.
Author (GRA)

N71-28432# Massachusetts Inst. of Tech., Cambridge.
IN-PROCESS MANUFACTURING QUALITY CONTROL
Donal E. Lewin (Ph.D. Thesis) Jan. 1971 539 p refs
(Contract N00014-70-A-0362-0001)
(AD-720098; MAC-TR-83) Avail: NTIS CSCL 13/8

The thesis develops a methodology for designing plans for the allocation of in-process inspection effort. The focus of the thesis is on constructing operating rules for the allocation of inspection effort along a production line in which inspection and repair are integral parts of that line. The essential feature of such operating rules is their adaptability, i.e., their capacity to detect and respond to changes in the quality levels at various parts of the manufacturing process. The basic methodology is an application of micro-economic analysis to the production process. The major features restricting the problem setting needed for the proposed methodology to be applicalbe are the following: (1) discrete production units and production sub-processes; (2) identifiability of a finite set of independent attribute defects (or surrogate defects); (3) no information available to monitor the current state of the production process by any means other than inspection of the product; (4) nondestructive inspection, and (5) repairable defects.
Author (GRA)

N71-28445*# Planning Research Corp., Los Angeles, Calif.
A SYSTEMS ANALYSIS OF APPLICATIONS OF EARTH ORBITAL SPACE TECHNOLOGY TO SELECTED CASES IN WATER MANAGEMENT AND AGRICULTURE. VOLUME 2: TECHNICAL REPORT
Nov. 1969 323 p refs Revised
(Contract NASw-1816)
(NASA-CR-119011; PRC-R-1124-Vol-2-Rev) Avail: NTIS CSCL 02C

A systems analysis is presented of three of the many uses of space technology for earth applications including the management of the regional demand and supply of water (emphasizing the generation of hydroelectric power, flood control, irrigation, and recreation); the management of the world wheat crop (emphasizing the impact of fluctuations on the United States as the major exporter); and the control of wheat rust, a principal cause of wheat losses in the United States and abroad. The estimated total system costs, including R and D, investment, and 20 years' annual operating costs were evaluated. The United States' benefits from the three cases were estimated at 10.5 billion for the 1970-90 period, and world benefits were estimated at $50 billion. The wheat rust case requires more frequent monitoring (every 12 hours) by the four-satellite system proposed and the use of radar. Aircraft overflights offer a lower cost alternative than a satellite system used solely for wheat rust control. The water management case required 6-hour coverage and the full use of the satellite system. The cost-benefit ratios are substantial, and the satellite is superior to aircraft and other alternatives if a major portion of the United States' river basins are covered.
Author

N71-28446*# Planning Research Corp., Los Angeles, Calif.
A SYSTEMS ANALYSIS OF APPLICATIONS OF EARTH ORBITAL SPACE TECHNOLOGY TO SELECTED CASES IN WATER MANAGEMENT AND AGRICULTURE. VOLUME 2: TECHNICAL REPORT, APPENDIXES
Nov. 1969 558 p refs Revised
(Contract NASw-1816)
(NASA-CR-119012; PRC-R-1224-Vol-2-App-Rev) Avail: NTIS HC $6.00/MF $0.95 CSCL 02C

Appendices are presented for the systems analysis of satellite borne remote multispectral sensors for application to water and wheat crop management and wheat fungi control. Hydrology and agriculture user sensor models and hydrological models are included as well as system operation and benefits, date, satellite system description and costs, alternative information systems, noninformation alternatives, wheat production management, and wheat rust control.
J.M.

N71-28540*# National Aeronautics and Space Administration, Washington, D.C.
GOVERNMENT, INDUSTRY, AND UNIVERSITY COOPERATION FOR ADVANCED RESEARCH AND TECHNOLOGY

F. B. Smith *In its* Biotechnology 1971 p 185–192

Avail: SOD $2.75; NTIS CSCL 05A

A three way university-industry-Government cooperation in space research and technology is advocated. Some space industry accomplishments in aerospace technical developments are briefly described and their adaptations to nonspace needs are outlined. G.G.

N71-29066# Joint Publications Research Service, Washington, D.C.

SCIENTIFIC AND TECHNICAL PROGRESS RATE: INDEX OF EFFICIENCY OF CONTROL OF THE ECONOMY

V. A. Trapeznikov 2 Jun. 1971 47 p refs Transl. into ENGLISH from Avtomat. i Telemekh. (Moscow), no. 4, 1971 p 5–36

(JPRS-53271) Avail: NTIS

The economic role of scientific and technical progress in controlling the national economy is demonstrated, and the economic effectiveness of science is evaluated. The standard of living increase is presented as a function of scientific and technical progress. A foundation is laid for the information nature of labor and the difference in stored information and consumed information in the control process. Author

N71-29331*# Hudson Inst., Inc., Croton-on-Hudson, N.Y.

CONTEXTUAL PLANNING FOR NASA: A SECOND WORKBOOK OF ALTERNATIVE FUTURE ENVIRONMENTS FOR MISSION ANALYSIS, VOLUME 1 Interim Report

Anthony J. Wiener, B. Bruce-Briggs, Frank Armbruster, and Arthur Springer 30 Apr. 1971 223 p refs

(Contract NAS2-5431)

(NASA-CR-114336; HI-1272/3-RR-Vol-1; IR-2) Avail: NTIS CSCL 22A

A study was undertaken to improve the capability for making preliminary selections among alternative space program objectives, particularly for long term projects. Economic, social, and political aspects are investigated, and their influence on the future of NASA's policy goals. The goals of various groups in the American society, the changes in these goals, and the evaluation of programs in terms of these goals are explored in detail. Attitudes toward science, nationalism, and internationalism are also described. It is stated that most Americans are not excited by scientific and technological advance unless they are shown that there is some reasonable and immediate chance of direct benefits. New directions for the space program to satisfy the new social, financial, and political attitudes are suggested and include international cooperation, military emphasis, earth applications, and lower cost programs. N.E.N.

N71-29422# Technische Univ., Berlin (West Germany). Inst. fuer Raumfahrttechnik.

THE BENEFIT OF SPACE RESEARCH FROM THE GERMAN POINT OF VIEW. A MACRO MODEL FOR ESTIMATING THE MAGNITUDE OF SPACE RESEARCH BENEFITS FOR THE FEDERAL REPUBLIC OF GERMANY, PART 3B [UEBER DEN NUTZEN DER WELTRAUMFORSCHUNG AUS DEUTSCHER SICHT. EIN MAKROMODELL FUER DIE ABSCHAETZUNG DER GROESSENORDNUNG DES AUS DER WELTRAUMFORSCHUNG ABLEITBAREN NUTZENS FUER DIE BRD]

Heinz-Hermann Koelle, Gerd Ehinger, Frank Heidtmann, Fritz Lienemann, Goetz Niederau et al Bad Godesberg, West Ger. Bundesmin. fuer Bildung und Wiss. Jan. 1971 209 p refs In GERMAN; ENGLISH summary Sponsored by Bundesmin. fuer Bildung und Wiss.

(BMBW-FB-W-71-04-Pt-3) Avail: NTIS; ZLDI Munich: 43,70 DM

A cost benefit model for space programs of the German Federal Republic is developed. The purpose of the model is to provide a decision aid for planning the German space program. The aim of this effort is to determine the benefit of space projects in their magnitude and trends. Furthermore the cost benefit ratios of alternative space programs are investigated and described. The proposed projects are described along with the inquiries carried out throughout this project and used computer programs as well as an extensive bibliography are listed. Author (ESRO)

N71-29549# RAND Corp., Santa Monica, Calif.

MEETING TOMORROW'S LOGISTICS CHALLENGES WITH NOW RESEARCH

Donald E. Lewis and Thomas T. Tierney Mar. 1971 33 p refs Presented at the Worldwide Materiel Conf., McClellan AFB, Calif., 28–29 Oct. 1970

(Contract F44620-67-C-0045)

(AD-722420; R-686-PR) Avail: NTIS CSCL 15/5

Documentation is made of a presentation before the Worldwide Materiel Conference that discusses the value of current logistics research in reducing future uncertainties and risks and in describing future consequences of present resource commitments. Past research on METRIC, on air transport of recoverable items, on scheduled maintenance, and on repair tradeoffs between base and depot are cited as examples of relevant research. Three studies have implications for the future: remotely piloted systems; force capability reporting; and aircraft maintenance scheduling policy. Author (GRA)

N71-30276# National Science Foundation, Washington, D.C.

FEDERAL FUNDS FOR ACADEMIC SCIENCE, FISCAL YEAR 1969

Feb. 1971 33 p refs

(NSF-71-7) Avail: SOD $1.00

Ten Federal agencies reported a total of $2,314 million for academic science activities during fiscal year 1969, representing virtually the same level of Federal funding of academic science as reported for fiscal year 1968. In most program areas the Department of Health, Education, and Welfare (HEW) was the primary source of funds, accounting for a total of $1,245 million, or more than one-half of all obligations from the Federal Government. The National Science Foundation (NSF) with $362 million, or nearly one-sixth of the Federal-wide total, was second in sponsorship of academic science activities. Other agencies contributing significant shares of academic science support in 1969 were the Department of Defense (DOD), $272 million; the Department of Agriculture (USDA), $155 million; the National Aeronautics and Space Administration (NASA), $125 million; and the Atomic Energy Commission (AEC), $121 million. Author

N71-30277# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

SEVERAL PROBLEMS OF ORGANIZATION OF SCIENCE IN THE EPOCH OF THE SCIENTIFIC-TECHNICAL REVOLUTION

M. K. Petrov 2 Feb. 1971 29 p Transl. into ENGLISH from Vopr. Filosofii (USSR), v. 22, no. 10, 1968 p 36–45

(AD-722307; FTD-MT-24-235-70) Avail: NTIS CSCL 5/9

The article discusses productivity of purely scientific work as opposed to industrial production. It is underlined that whereas

mass production involves a repetition of single acts, and productivity can increase as the manufacturing process improves, purely scientific work forbids repetition of a single productive act. The organization of science requires further study if its productivity is to be correctly judged. GRA

N71-30368*+ California Univ., Berkeley. Space Sciences Lab.
CAN A MANAGER TEACH AN AUTOMATED INFORMATION SYSTEM?
C. West Churchman May 1971 12 p Presented at TIMS 18 Intern. Meeting, Washington, D.C., 22 Mar. 1971 *Its* Internal Working Paper No. 2
(Grant NGL-05-003-404)
(NASA-CR-119180) Avail: NTIS

The problems associated with programming a computer to make management decisions are discussed. The inventory control decision is used as a basic example, and an adaptive mode for the computer to learn about the world of a manager is described. It is felt that many recent advances in psychology must be incorporated into the understanding of how a management information system should work. N.E.N.

N71-30506*# National Aeronautics and Space Administration, Washington, D.C.
JOINT DOT-NASA CIVIL AVIATION RESEARCH AND DEVELOPMENT POLICY STUDY: REPORT
Mar. 1971 104 p refs Prepared in cooperation with Dept. of Transportation
(NASA-SP-265; DOT-TST-10-4) Avail: NTIS CSCL 01B

Analyses of such varied subjects as long- and short-haul passenger service air cargo, general aviation, air vehicles, air traffic control, airports, complementary surface transportation, financial considerations, institutional and environmental factors, foreign competition, military contributions to civil aviation benefits, and several key policy issues are presented. Author

N71-30507*# National Aeronautics and Space Administration, Washington, D.C.
JOINT DOT-NASA CIVIL AVIATION RESEARCH AND DEVELOPMENT POLICY STUDY: SUPPORTING PAPERS
Mar. 1971 248 p refs Prepared in cooperation with Dept. of Transportation
(NASA-SP-266; DOT-TSY-10-5) Avail: NTIS CSCL 01B

A variety of subjects, some technical- which relate directly to civil aviation research and development - and some nontechnical - which affect the climate for technical innovation in the civil aviation industry and therefore determine whether the results of research and development will find application in the future are discussed. The specific missions performed by civil aviation and the four system elements of each of these missions are presented. Each technical section is based on analyses of the characteristics and growth to date, current problems, future requirements (demand for service), potential solutions, implication for R&D, and recommendations. Author

N71-30517 Civil Aeronautics Board, Washington, D.C.
REMARKS PREPARED FOR DELIVERY BY THE HONORABLE SECOR D. BROWNE, CHAIRMAN, CIVIL AERONAUTICS BOARD BEFORE THE AIRLINE FINANCE AND ACCOUNTING CONFERENCE
Secor D. Browne [1970] 5 p Conf. held in New Orleans, 2 Nov. 1970
Avail: NTIS

The comments of the chairman of the Civil Aeronautics Board to the conference of airline financial executives are presented. The need for clear two-way communication between the board and the airlines was stressed along with the importance of budgeting and cost control. F.O.S.

N71-30645# Nordforsk, Copenhagen (Denmark).
NORDFORSK'S STUDY OF ENVIRONMENTAL PROBLEMS. COLLABORATION IN POLLUTION QUESTIONS [NORDFORSKS MILJOEVAERDSUTREDNING. SAMARBETE ROERANDE FOERORENINGSFRAEGORNA]
Nils Mustelin and Anders Aekerblom [1969] 110 p refs In DANISH
Avail: NTIS

In studying the possibility of collaboration in Scandinavia in the field of environment pollution, Nordforsk has investigated the present state of affairs in Denmark, Norway, Sweden, and Finland concerning air-, water-, and agricultural pollution (pesticides). The aim of this study is to advise the Scandinavian Council as to the possibility of a common legislation concerning the environment. ESRO

N71-30800*# West Virginia Univ., Morgantown. Summer Predoctoral Fellowship Program in Engineering Systems Design.
FUTURE AIR TRAFFIC: A STUDY OF THE TERMINAL AREA
Richard E. Schmotzer, Albert N. Andry, Michael G. Harris, and Gerald F. Reid, eds. 1970 373 p refs
(Grant NGT-49-001-045)
(NASA-CR-119287) Avail: NTIS HC $6.00/MF $0.95 CSCL 01E

The processes involved in the systems design of terminal area air traffic control systems through the year 2000 are outlined. The demand and terminal area performance characteristics of aircraft were determined by looking at today's demand and types of aircraft and extrapolating the data to the year 2000. Air traffic control methods, takeoff and landing criteria, and air collision avoidance procedures and hardware were formulated to minimize, safely and economically, terminal-area operation time for the year 2000. A simulation model was developed for terminal area operation for the present day system and for the future. The model permitted tradeoff studies such as new runways versus new airports or straight-in approaches versus curved approaches. Author

N71-30889*+ National Aeronautics and Space Administration, Washington, D.C.
MANAGEMENT: A CONTINUING LITERATURE SURVEY WITH INDEXES
May 1971 135 p ref
(NASA-SP-7500(05)) Avail: NTIS CSCL 05A

A compilation of references to selected unclassified reports and journal articles on the subject of management is presented. This publication assembles groups of citations previously announced in 1970 in separate journals - Scientific and Technical Aerospace Reports (STAR), International Aerospace Abstracts (IAA), and U.S. Government Research and Development Reports (USGRDR) - together with other reports included in the NASA system but not previously announced. Four earlier issues of this continuing survey have been published. The first issue (NASA SP-7500) covered documents generated or sponsored by NASA

from 1962 through 1967; NASA SP-7500 (02) covered documents generated or sponsored by agencies other than NASA in the same time period; NASA SP-7500 (03) covered NASA and non-NASA documents acquired in 1968; and NASA SP-7500 (04) not only covered NASA and non-NASA documents acquired in 1969 but also, like the present supplement, contained a separate section on documents provided by the Defense Documentation Center. The present issue contains 509 references. Author

N71-31279*# Interplan Corp., Santa Barbara, Calif.
REVIEW AND APPRAISAL: COST-BENEFIT ANALYSES OF EARTH RESOURCES SURVEY SATELLITE SYSTEMS
Roman Krzyczkowski, David N. Powell, Jr., and Evelyn S. Putnam Mar. 1971 161 p refs
(Contract NASw-2084)
(NASA-CR-119363; Rept-7016R) Avail: NTIS CSCL 22A

Ten studies concerned with the benefits and costs of remote sensing of earth resources were reviewed and appraised to assess: the extent to which the findings can be considered to be adequate indicators of the cost-benefit effectiveness of future operational ERS satellites, and the value of these studies of the ERS Program in directing R&D activities. The findings of this review and appraisal were used in formulating conclusions on the appropriate nature of future studies in the ERS Program. Author

N71-31388# Programmes Analysis Unit, Didcot (England).
AN OUTLINE OF EVALUATION AS PRACTISED BY THE PROGRAMMES ANALYSIS UNIT WITH THREE CASE STUDIES Lectures delivered at the College of Europe
P. M. S. Jones and H. Hunt Nov. 1969 83 p refs Presented at Bruges, Belgium, 9 Sep. 1969
(PAU-M-12) Copyright. Avail: NTIS; HMSO 12s; BIS $2.50

CONTENTS:

1. AN OUTLINE OF PROGRAMME EVALUATION AS PRACTICED BY THE PROGRAMMES ANALYSIS UNIT P. M. S. Jones p 1–18 refs
2. SINGLE PROJECT EVALUATION: HYDROSTATIC EXTRUSION, PART A P. M. S. Jones p 19–27 refs
3. PORTFOLIO ANALYSIS, PART B P. M. S. Jones p 28–70 refs
4. SYSTEMS ANALYSIS APPLIED TO MARINE TECHNOLOGY PART C H. Hunt p 71–84 refs

N71-31389# Programmes Analysis Unit, Didcot (England).
AN OUTLINE OF PROGRAMME EVALUATION AS PRACTICED BY THE PROGRAMMES ANALYSIS UNIT
P. M. S. Jones *In its* Outline of Evaluation as Practised by the Programmes Analysis Unit with Three Case Studies Nov. 1969 p 1–18 refs
Copyright. Avail: NTIS; HMSO 12s; BIS $2.50

Methods and techniques used in R and D program evaluation are summarized. Management science and operations research techniques are discussed including cost estimates, cost/benefit analysis, decision making, technology forecasting, dynamic models, the Delphi technique, and market research. J.M.

N71-31391# Programmes Analysis Unit, Didcot (England).
PORTFOLIO ANALYSIS, PART B
P. M. S. Jones *In its* Outline of Evaluation as Practised by the Programmes Analysis Unit with Three Case Studies Nov. 1969 p 28–70 refs
Copyright. Avail: NTIS; HMSO 12s; BIS $2.50

The problem of either maximizing the return within given resource constraints or deciding on the appropriate level of resource constraint is discussed in a portfolio analysis for investment in an associated group of projects covering a technical area. The importance of non-R and D options, qualitative modeling, and interacting benefits is stressed in a method for defining resource constraints. A mathematical model for the derivation of appropriate investments in R and D is outlined. J.M.

N71-31392# Programmes Analysis Unit, Didcot (England).
SYSTEMS ANALYSIS APPLIED TO MARINE TECHNOLOGY, PART C
H. Hunt *In its* Outline of Evaluation as Practised by the Programmes Analysis Unit with Three Case Studies Nov. 1969 p 71–84 refs
Copyright. Avail: NTIS; HMSO 12s; BIS $2.50

Techniques used in the application of systems analysis to marine technology in Great Britain are summarized including matrix or tabular methods. Sectorial analyses are discussed for fishing, based on world protein demand forecasts combined with catch estimates for marketing and investments; and marine minerals, based on qualitative and quantitative models of mineral resources in the continental shelf for economic and cost/benefit analyses of mineral extraction methods. J.M.

N71-31425# North American Rockwell Corp., Downey, Calif. Space Div.
NATURAL RESOURCE MANAGEMENT INFORMATION SYSTEM AND REMOTE SENSING APPLICATIONS. INFORMATION REQUIREMENTS STUDY FOR INDIAN OPPORTUNITY PROGRAM ECONOMIC IMPROVEMENTS
18 Jun. 1970 167 p refs Prepared for Bur. of Indian Affairs
Original contains color illustrations
(SD-70-351) Avail: NTIS

The results of a preliminary study designed to aid the Bureau of Indian Affairs (BIA) in the evolutionary progression of natural resources management and of reservation economic improvement are presented as an over-view of the requirements for a natural resources management information system and of the potential application of remote sensing technology to natural resource programs. It presents the study rationale, objectives and scope; the major concepts of BIA programs, emphasizing natural resources; an outline of two remote sensing programs; a systematic orientation of BIA natural resources programs and problem areas with remote sensing applications; and the delineation of a natural resources management information system methodology. Author

N71-31472# Joint Publications Research Service, Washington, D.C.
PHILOSOPHICAL-METHODOLOGICAL PROBLEMS OF THE SYSTEMS APPROACH
V. A. Lektoroskiy et al 30 Jun. 1971 14 p refs Transl. into ENGLISH from Vopr. Filosofii (USSR), no. 1, 1971 p 146–153
(JPRS-53494) Avail: NTIS

An overview is presented of the systems approach for the analysis of systems-structural objects in modern science. Systems approach is defined as the theoretical discussion of methods and principles of researching objects as systems, and in this sense, is considered to be a special line of development of methodological analysis, oriented toward discovering the means and premises of

systems research. The philosophico-methodological problems of the systems approach, as experienced by scientists and related in various publications, are critically interpreted. D.L.G.

N71-31516*# National Aeronautics and Space Administration, Washington, D.C. Technology Utilization Office.
MANAGEMENT TECHNIQUES: A COMPILATION
1970 21 p
(NASA-SP-5933(01)) Avail: NTIS CSCL 05A

A selection of management techniques is presented in summary form, covering a wide range of efficiency and cost-saving programs. Representative techniques discussed include new management and training concepts; accounting and time-use methods which update costs for any given period; computer checks on engineering and schedule effectiveness; data reduction; automated forms and control; and long range planning of manpower. Author

N71-31520# Committee on Science and Astronautics (U. S. House).
FACILITIES ACQUISITION: NASA
Washington GPO 1971 49 p refs Hearings before Comm. on Sci. and Astronaut., 92d Congr., 1st Sess., No. 6, 18 Jun. 1971
Avail: Subcomm. on NASA Oversight

Comments on NASA's policies and procedures concerning the acquisition of a capital plant are presented. Cost of facilities cycles to forecast R and D needs and R and D and R and P.M. appropriations for facility projects are discussed. Facilities management activities and needs in the future for NASA including the policies and procedures required to implement them are summarized. J.M.

N71-31578# Technische Hochschule Carola Wilhelmina, Brunswick (West Germany).
AUTOMATED PLANNING, CONTROL, AND COST SUPERVISION IN MANUFACTURING WITH SPECIAL EMPHASIS ON TIME-AMOUNT-SERIES [AUTOMATISIERTE PLANUNG, STEUERUNG UND KOSTENUEBERWACHUNG FUER DIE FERTIGUNG MIT BESONDERER BERUECKSICHTIGUNG VON ZEIT-MENGEN- REIHEN]
Ehrhart Geuss (Ph.D. Thesis) 1970 145 p refs In GERMAN
Avail: NTIS

The automatic control of preliminary planning for manufacturing process by integration of mathematical methods is developed. Typical problems of manufacturing and disposition are considered for: (1) the importance of time-amount series; (2) the mathematical treatment of requirement calculations; (3) the realization of the production process, purchasing positions, and individual manufacturing steps by computer processing; (5) the incorporation of procedures into a material supply organization; and (6) estimation and control of production costs. Transl. by G.G.

N71-31624# Department of Transportation, Washington, D.C.
INVESTIGATION OF CHARTER AIRCRAFT SERVICES, VOLUME 1
5 Feb. 1971 82 p refs
(PB-197636) Avail: NTIS CSCL 01B

An in-depth investigation of charter operations utilizing large airplanes was conducted to determine the true condition of air charter operations. The investigation included activities peripheral to the commercial operation of large airplanes and any and all other factors affecting the safety of this segment of the aviation industry. It is agreed that the regulated air carriers and commercial operators are not fulfilling the total demands of the marketplace. However, the limited time allocated to the project precluded the full development of information relating to the magnitude of the requirement for air charter operations. E.M.C.

N71-31900# Battelle Memorial Inst., Columbus, Ohio.
THE FEDERAL R AND D PLAN FOR AIR POLLUTION CONTROL BY COMBUSTION-PROCESS MODIFICATION Final Report
11 Jan. 1971 352 p refs
(Contract CPA-22-69-147)
(PB-198066; APTD-0643) Avail: NTIS HC $6.00/MF $0.95 CSCL 13B

Results are reported of a study conducted for the Air Pollution Control Office to (1) identify gaps in combustion technology and (2) recommend a 5-year plan with priorities for effectively allocating resources for APCO supported combustion R and D directed toward meeting projected needs for air pollution control of energy conversion system by combustion modification. Combustion applications considered as elements of the plan include: central station power generation; industrial processing; industrial steam generation, commercial and residential heating; gas turbines and external combustion engines; and reciprocating internal combustion engines. A 5-year plan of combustion R and D is presented, with R and D opportunities identified and ranked in five priority levels. GRA

N71-31965# Center for the Environment and Man, Inc., Hartford, Conn.
A COST EFFECTIVENESS METHODOLOGY FOR ENVIRONMENTAL DATA COLLECTION SYSTEMS, PHASE 3 Final Report
Gaylord M. Northrop, Earl L. Davis, Edward R. Sweeton, and Fletcher L. Tholomew 31 Dec. 1970 209 p refs
(Contract DOT-CG-02006-A)
(AD-722596, CEM-4053-430) Avail: NTIS CSCL 8/10

The report summarizes the accomplishement of the following three Objectives: Develop a versatile computerized cost effectiveness (CE) model that is applicable to National Data Buoy Systems and other national marine environmental data collection systems; Obtain for use with the CE model quantified expert judgement concerning data users requirements and estimates of data collection system performance and costs; Demonstrate the applicability of the improved CE model to analysis of postulated data collection system concepts, including data buoys in a system mix with other data collection platforms. It describes the activities that have been performed in developing a computerized CE Methodology embracing extensive use of quantified expert judgment and tailored specifically to serve as an aid in project decision making. Author (GRA)

N71-31977# Joint Publications Research Service, Washington, D.C.
TECHNICAL PROGRESS AND SCIENTIFIC-TECHNICAL INFORMATION
A. I. Mikhaylov *In its* Inform. Retrieval in the Field of Chem. 6 Jul. 1971 p 1–9 refs
Avail: NTIS

The development, differentiation, specialization, and interaction of scientific fields in chemistry are discussed including the resultant increase in recorded scientific and technical information and its dissemination and utilization. The network of information agencies in the U.S.S.R. is summarized along with the principal functions performed by the datamation centers. J.M.

N71-32255# RAND Corp., Santa Monica, Calif.
HOW SHALL WE EMPLOY THE TECHNICALLY TRAINED?
Victor Gilinsky Feb. 1971 10 p refs
Avail: NTIS

Manpower employment problems are summarized which have developed from the concentration of government research and development expenditure in a small number of industries in order to meet narrow high-priority technological goals, and the channeling of government funds to universities in order to provide the industries with large numbers of specialists. The rapid change, incentives of industry and universities, education and retraining, and the institutional commitment are discussed. J.M.

N71-32294# RAND Corp., Santa Monica, Calif.
TECHNOLOGY TRANSFER MODEL
Samuel N. Bar-Zakay Nov. 1970 30 p refs
(P-4509) Avail: NTIS

A model is developed for the transfer of technology from an advanced country to an underdeveloped country. Details are given on the search, adaptation, implementation, and maintenance stages, and technological forecasting, long-range planning, and project-related intelligence activities are described. It is concluded that the recipient (and the donor) must have considerable analytic capabilities, and the sooner the forecasting, planning, and intelligence activities are created, the sooner the developing countries will be able to utilize their scarce resources more efficiently. It is also concluded that the developing countries must perform the technological assessment and analyze the socioeconomic implications of the technological development. N.E.N.

N71-32495*# Maryland Univ., College Park. Computer Science Center.
A CRITICAL LOOK AT PERT ANALYSIS
Richard M. Nicholson Apr. 1971 110 p refs
(Grant NGL-21-002-008)
(NASA-CR-119777; TR-154) Avail: NTIS CSCL 05A

The assumptions inherent in most PERT implementations, particularly that of the critical path, are investigated and the errors which can result from PERT analysis are indicated. A model for performing the PERT calculations without these errors resulting is derived and output from this model is displayed. A system for project management incorporating this model is described. A program listing of the model implemented is presented. Author

N71-32521# Indiana Univ. Foundation, Bloomington. Aerospace Research Applications Center.
OPERATION OF A UNIVERSITY-BASED TECHNOLOGY AND INFORMATION TRANSFER CENTER
Joseph Di Salvo [1970] 137 p refs
(Contract NASw-1942)
(NASA-CR-121283) Avail: NTIS CSCL 05B

The problem of effectively utilizing technical information, which is so prolifically being generated by our society is characterized as one of the great challenges facing mankind. The topic is covered in some detail from an operational experience viewpoint. The experimental efforts undertaken to transfer technology via a university-based information Center to industrial organizations are reviewed. Information requirements and habits of industrial scientists and engineers are discussed. Information services and products designed to meet the requirements are presented. A system of cost accounting for an information dissemination function is described as well as experiences in market acceptance of the concept of buying information services. Selected transfer case histories are discussed and a number of implications of the technology transfer process are reviewed. Some suggestions for application of further resources are made. Author

N71-32556# RAND Corp., Santa Monica, Calif.
SOME ECONOMIC ASPECTS OF RAIN STIMULATION
R. R. Rapp Dec. 1970 13 p refs Presented at ASME meeting, Phoenix, Ariz., 11-14 Jan. 1971
(P-4524) Avail: NTIS

An economic analysis is presented on weather modification for increased rainfall over Israel to increase the stored water supply and the amount of water available for irrigation. Annual rainfall distribution, normal precipitation for eastern Mediterranean countries, and the water supply distribution of Israel are given in graphical representations. J.A.M.

N71-32624# Coast Guard, Washington, D.C.
OIL POLLUTION LIABILITY AND FINANCIAL RESPONSIBILITY. A REPORT TO THE PRESIDENT AND THE CONGRESS Final Report
Dec. 1970 25 p
(PB-198775; USCG-OIL-70-1) Avail: NTIS

The report summarized a study on the need for measures to provide financial responsibility and limitation of liability for vessels, onshore and offshore facilities for costs of removing discharged oil and payment of damages resulting from the discharge. The report recommends to the President and the Congress no change in liability for vessels, federal preemption for vessels in interstate commerce, and that varying schedules of proof of financial responsibility of onshore and offshore facilities be established based on the pollution potential of the facility. GRA

N71-32625# George Washington Univ., Washington, D.C.
LEGAL, ECONOMIC, AND TECHNICAL ASPECTS OF LIABILITY AND FINANCIAL RESPONSIBILITY AS RELATED TO OIL POLLUTION Final Report
Dec. 1970 347 p refs
(Contract DOT-CG-10255-A)
(PB-198775; USCG-OIL-70-2) Avail: NTIS HC $6.00/MF $0.95 CSCL 13B

An intensive study of the oil pollution problem in its legal, economic and technical aspects is presented. The contents include the following: Analysis of the water quality improvement act; Theories of liability and their relation to oil pollution; Potential problems of the act; Jurisdiction; Economic principles of liability and financial responsibility for oil pollution; Oil pollution prevention and carrier liability; Economic models for analysis of problems; Relationships between cleanup costs and quantity of oil spilled; Measures of the potential economic loss from pollution; International trade implications of U.S. policies; The nature, behavior, and ecological effects of oil spills; Method for containment and cleanup of oil spills; and Oil pollution prevention and the characteristics of the oil industry production, transporting, and storage facilities. GRA

N71-32639# National Science Foundation, Washington, D.C.
RESEARCH AND DEVELOPMENT IN LOCAL GOVERNMENTS, FISCAL YEARS 1968 AND 1969
Wayne Zajac et al Jan. 1971 64 p refs
(NSF-71-6) Avail: SOD $0.65

Information and data on the nature and extent of local government participation in research and development is presented for the fiscal years 1968 and 1969. Data cover problems of modern society-poverty, crime, inadequate education, and pollution. Also discussed are new techniques, methods, and equipment to alleviate some of these conditions. The data are compared to that of fiscal years 1966 and 1967. E.H.W.

N71-32692# *National Science Foundation, Washington, D.C.*
SCIENTIFIC ACTIVITIES OF INDEPENDENT NONPROFIT INSTITUTIONS: REPORT ON A SURVEY OF 1970 EMPLOYMENT AND 1969 EXPENDITURES
1970 71 p
(NSF-71-9) Avail: SOD $0.70

The results of the National Science Foundation's 1970 survey of scientific activities of independent nonprofit institutions are summarized. It excludes scientific activities funded by nonprofit institutions, but performed by other organizations and includes voluntary nonprofit hospitals. Total employment including scientists, engineers, and technicians; total expenditures; and intramural R and D performance of nonprofit institutions are reviewed. Author

N71-32721# National Bureau of Standards, Washington, D.C.
DEPARTMENT OF DEFENSE: US METRIC STUDY Interim Report
L. E. Barbrow Jun. 1971 125 p
(NBS-SP-345-9) Avail: SOD $1.25

The results are reported of a Department of Defense study, conducted pursuant to the U.S. Metric Study Act, to determine and evaluate the advantages and disadvantages, including impact on operational capability, that would attend adoption of the International System of Units of weights and measures for use in the Department (DoD). Cost estimates for each of the major components of the DoD of transition to metric system usage are included. In addition to discussing the specific advantages and disadvantages that would be expected within the Department, the dependence of the DoD on the national industrial base is described and how this interaction would be involved in a national metrication effort is discussed. Author

N71-32740# General Accounting Office, Washington, D.C. Office of the Comptroller General of the United States.
OVERSTATEMENT OF CONTRACT TARGET COST FOR FIRST STAGE OF SATURN 5 LAUNCH VEHICLE; B-161366, NATIONAL AERONAUTICS AND SPACE ADMINISTRATION Report to the Congress
Elmer B. Staats 26 Oct. 1970 30 p refs
Avail: NTIS

An examination to determine the cause of target cost underrun for the first stage of Saturn 5 launch vehicle was conducted. The examination included certain materials cost and indirect costs which were overstated by the contractor. Conclusions show that the contract target cost was overstated because the contractor did not adjust its proposals to eliminate the cost of excessive quantities of certain materials, or recognize certain cost pricing data was available before the dates of its pricing certificates. E.H.W.

N71-32749# National Bureau of Standards, Washington, D.C.
US METRIC STUDY. FEDERAL GOVERNMENT: CIVILIAN AGENCIES Interim Report
Jul. 1971 323 p refs 2d in a ser. of Rept. prepared for the Congress
(NBS-SP-345-2) Avail: SOD $2.25

The findings of a survey to ascertain the views of the civilian agencies of the Federal Government on the issues raised by the U.S. Metric Study Act are reported. With regard to internal operations of the Federal agencies, metric (International System of Units, or SI) usage and its advantages and disadvantages, expectations of future changes in measurement usage if the U.S. continues its laissez faire policy toward the SI, and attitudes toward a possible nationally coordinated metrication program are covered. Estimates are given of added cost or savings impacts on agency internal operating budgets to be expected from a nominally 10-year planned metrication program, both during the transition and thereafter. The survey also assessed the impacts of metric usage and of its increase on the areas of responsibility of the Federal agencies in the society at large (e.g., communications, science and technology, health, labor affairs, international affairs, and trade), and on the agencies' interfaces therewith. Author

N71-32943*# National Materials Advisory Board, Washington, D.C.
ACCELERATING UTILIZATION OF NEW MATERIAL
May 1971 107 p refs Sponsored in part by NASA
(Contract DA-49-083-OSA-3131)
(NASA-CR-121375; NMAB-283) Avail: NTIS CSCL 11D

Because of concern regarding the slow rate of introducing new materials into national programs, the National Materials Advisory Board sought to identify the factors that promote or inhibit their use. The advantages to be derived from new materials are documented. Case histories of past material introductions are discussed. Using these histories as a foundation, the factors that constrain or which promote progress in introducing new materials into hardware are identified. The constraints and promoters are organized into four categories: technical, economic, contractual, and management and organization. Recommendations are included. Author

N71-33131# RAND Corp., Santa Monica, Calif.
ON THE LIMITATIONS OF QUANTITATIVE ANALYSIS
E. S. Quade Dec. 1970 24 p refs Presented at the 137th Meeting of the American Association for the Advancement of Science, Chicago, 26 Dec. 1970
(P-4530) Avail: NTIS

An evaluation of the usefulness of quantitative analyses is presented with respect to problems of public affairs and government decision-making. It is felt that analysis is completely quantified if the problem can be described purely on the basis of the results obtained from the model, but that such situations are usually not found in the domain of public policy. Internal limitations also exist in the ultimate reduction of quantitative analysis to a sequence of judgments. Much progress has been made in recent years, however, toward overcoming methodological difficulties and in applying this type of analysis to a larger subject area. Nonetheless, when considering its use, it is necessary to carefully ascertain its suitability for the problem at hand. Where applicable, relevant information on performance and costs can be obtained. The method also often counters the subjective approach on the part of advocates of a program and may force them to change their line of argument to consider realities, rather than merely expressing their personal opinions. A.C.R.

N71-33417# RAND Corp., Santa Monica, Calif.
TECHNOLOGY ASSESSMENT: A BIBLIOGRAPHY
Ethel L. Chamberlain Jan. 1971 11 p refs

(P-4541) Avail: NTIS

A selected bibliography is presented dealing with changes in technology on existing technologies, social systems and the environment in general, with special emphasis on developing mechanisms to access these effects. Included are references to industry studies as well as theoretical discussions and some studies of the future. Author

N71-33716# National Science Foundation, Washington, D.C. Analytical Studies Group.

SCIENCE RESOURCES STUDIES: HIGHLIGHTS

25 Jan. 1971 4 p refs

(NSF-70-49) Avail: NTIS

A brief analysis is presented of Federal funding of academic science for fiscal year 1969. Funding for research and development, manpower development, facilities and equipment, general support for science, and other science activities are covered as well as funding by Agency. Institutional patterns of support are also discussed. J.M.

N71-33825# George Washington Univ. Washington, D.C.

CONVERSION OF SCIENTIFIC AND TECHNICAL RESOURCES ECONOMIC CHALLENGE: SOCIAL OPPORTUNITY

Ellis R. Mottur Mar. 1971 205 p refs Sponsored by NBS and US Arms Control and Disarmament Agency

(GWPS-Mon-8) Avail: NTIS

Conversion of America's scientific and technical resources from defense to civilian objectives is an urgent national necessity. While the need for conversion presents the nation with a significant economic challenge, it also affords an unparalleled social opportunity of turning our technical talents toward the resolution of America's besetting social ills in areas such as pollution, transportation, housing, urban services, health care, and education. The economic challenge and social opportunity presented by conversion are described and a series of policy proposals set forth as a national program for conversion of scientific and technical resources. Author

N71-33997 World Meteorological Organization, Geneva (Switzerland). World Weather Watch.

CONSOLIDATED LIST OF VOLUNTARY ASSISTANCE PROGRAMME PROJECTS APPROVED FOR CIRCULATION IN 1970

Jan. 1971 237 p

(WMO-289) Copyright. Avail: Issuing Activity

National programs proposed for Meteorological World Data Center are described. Cost estimation is given for each country, and the final WMO president's decision for program implementation financial assistance is stated. ERSO

N71-34112*# George Washington Univ., Washington, D.C. Technology Applications Group.

REVIEW OF FEDERAL RESEARCH AND DEVELOPMENT IN COMMAND/CONTROL CENTER DESIGN

2 Aug. 1971 55 p refs

(Contract NASw-2055)

(NASA-CR-121639) Avail: NTIS CSCL 17B

Information gathered of Federal; R&D efforts directly relevant to command/control center design is summarized. The methodology for this investigation consisted of:(1) reviewing information currently available and conducting information searches to identify relevant funders and performers of relevant R&D;(2) contacting identified Federal agency representatives to fully identify pertinent R&D effort; (3) contacting Federal agency and law enforcement organization personnel to determine characteristics of current and planned advances in technology state-of-the-art; and(4) reviewing pertinent publications. Author

N71-34248# RAND Corp., Santa Monica, Calif.

COST SENSITIVITY ANALYSIS OF A GROUND SENSOR SYSTEM

K. K. Weaver Apr. 1970 12 p

(P-4361) Avail: NTIS

Cost sensitivity analysis is defined as the systematic investigation of the relationship of total system costs and system design and cost parameters. The basic reason for sensitivity analysis is cited as the uncertainties present when the total cost of some system is evaluated. Examples are given to show how the range of uncertainty can vary from parameter to parameter. To illustrate the use of the cost sensitivity analysis technique, a typical cost analysis study is presented on a ground sensor system for use in locating enemy targets. Author

N71-34251# California Univ., Livermore. Lawrence Radiation Lab.

THE LAWRENCE RADIATION LABORATORY OCTOPUS

Samuel F. Mendicino Apr. 1971 18 p Presented at the Courant Symp. Series on Networks, N. Y., 29 Nov. 1970 Sponsored by AEC

(UCRL-73149; Conf-701128-1) Avail: NTIS

A historical account of the evolution of the Lawrence Radiation Laboratory Livermore Octopus network is given. The evolution of the Octopus from a centralized network to a distributed one that consists of a superimposition of specialized sub-networks is described. The problems of reliability and stability in the centralized network that was constantly changing and expanding have been minimized by the shift to decentralization. Each of the sub-networks perform specific network functions. They are interconnected but relatively independent of one another so that failures in a part of the network do not cause catastrophic interruptions of overall network service.

Author

N71-34338# National Academy of Engineering, Washington, D.C. Environmental Studies Board.

ENVIRONMENTAL PROBLEMS IN SOUTH FLORIDA, PART 2

Mar. 1970 85 p

(PB-199159) Avail: NTIS CSCL 13B

The methods of technology assessment are applied to help determine the environmental effects of building a jetport near the Everglades Park in southern Florida. The study details the safeguards necessary for using the site and recommends further study. A suggestion is made for intensified research on the effect of insect vectors from a tropical reservoir on public health.

Author

N71-34339# National Academy of Engineering, Washington, D.C. Environmental Studies Board.

INSTITUTIONS FOR EFFECTIVE MANAGEMENT OF THE ENVIRONMENT, PART 1

Jan. 1970 71 p
(PB-199180; NAS/NAE-ESB-70-1) Avail: NTIS CSCL 05A

A multidisciplinary approach to the nonscientific aspects of the deterioration of the environment is presented. The existing institutional arrangements for reversing environmental trends were determined to be inadequate. Suggestions are made for the development of new agencies, for research activities in government laboratories, for environmental education programs, and for Federal reorganization in Executive and Legislative branches. Author (GRA)

N71-34418*# Sandia Labs., Albuquerque, N. Mex.
CHECKLIST OF GOOD CONTAMINATION CONTROL PRACTICES FROM A MANUFACTURING VIEWPOINT
Douglas W. Ballard Apr. 1971 40 p refs Sponsored in part by AEC
(Contract NSR-09-010-027)
(NASA-CR-121740; SC-M-70-549) Avail: NTIS CSCL 13H

Contamination control problems continue to plague manufacturing facilities engaged in the production of high reliability precision components and assemblies. While the designer bears some responsibility for the problems, many of the problems can be attributed to poorly planned and executed manufacturing practices. Good contamination control practices in nine critical manufacturing areas are highlighted. The checklists, based on years of trouble-shooting experience, contain 131 recommendations that have proven effective in minimizing contamination problems. Author

N71-34542# *RAND Corp., Santa Monica, Calif.*
FIELD TESTING: METHODOLOGICAL CONSIDERATIONS AND A SPECIFIC EXAMPLE
T. S. Donaldson and R. J. Kaplan Nov. 1970 20 p refs Presented at 16th Conf. on the Design of Expt. in Army Res. Develop. and Testing, Fort Lee, Va., 21-23 October 1970
(P-4492) Avail: NTIS

The characteristics of field research methods are discussed including degrees of test control, tradeoffs, test purposes, and serendipity. A specific problem, Air Defense Command dispersal planning, is outlined and methods used in estimating sample size, the general experimental design, and selection of independent variables are shown. The study results are summarized and discussed. J.M.

N71-35167*# IIT Research Inst., Chicago, Ill.
AID/NASA PILOT PROJECT IN TECHNOLOGY TRANSFER TO A DEVELOPING NATION, KOREA. PHASE 2: TRAINING OF KOREAN SPECIALISTS Semiannual Report
Dec. 1970 153 p refs
(Contract NASw-2083)
(NASA-CR-121705; V6110-7) Avail: NTIS CSCL 05I

A detailed description and critique are presented of the project organization and communications activities for training Korean specialists in transfer methods and technology resources. Background information on the program scheduling and a critique prepared by the Korean participants are included along with conclusions and recommendations. J.M.

N71-35175# Committee on Public Works (U. S. Senate).
THE ECONOMICS OF CLEAN AIR Annual Report of the Administrator of the Environmental Protection Agency to the Congress of the United States
William D. Ruckelshaus Washington GPO 1971 196 p refs Rept. presented by Comm. on Public Works at the 92d Congr., 1st Sess., 16 Mar. 1971
(S-Doc-92-6) Avail: SOD $1.00

Twenty-three types of stationary air pollution sources are discussed under three major categories. The section on solid waste disposal gives estimates of the costs of controlling air pollution arising from open burning and incineration. Four types of fuel combustion sources are covered in the second section: (1) steam-electric power plants, (2) industrial boilers, (3) commercial-institutional heating plants, and (4) residential heating plants. The third section covers industrial process sources within the following industries: (1) kraft (sulfate) pulp, (2) iron and steel, (3) gray iron foundry, (4) sulfuric acid, (5) petroleum refining, (6) asphalt batching, (7) cement, (8) primary nonferrous metallurgy, (9) phosphate fertilizer, (10) lime, (11) coal cleaning, (12) petroleum products storage, (13) grain milling and handling, (14) varnish, (15) rubber (tires), (16) secondary nonferrous metallurgy, (17) elemental phosphous, and (18) brick and tile. One mobile source, motor vehicles, is discussed. Author

N71-35180# Committee on Government Operations (U. S. House).
APPLICATION OF AEROSPACE AND DEFENSE INDUSTRY TECHNOLOGY TO ENVIRONMENTAL PROBLEMS
Washington GPO 1970 263 p refs Hearings before Comm. on Govt. Operations, 91st Congr., 2d Sess., 23-24 Nov. 1970
Avail: Subcomm. on Conservation and Nat. Resources

Congressional testimony concerning the use of aerospace and defense industry resources and technology to the solution of problems concerning environmental pollution in presented. Statements made by legislative and technical personnel are published to explain the extent of the problem and to recommend actions for correcting the increasing deterioration of the environment. P.N.F.

N71-35181# Committee on Interior and Insular Affairs (U. S. Senate).
NATIONAL FUELS AND ENERGY POLICY
Washington GPO 1971 133 p refs Hearing on S. Res. 45 before Comm. on Interior and Insular Affairs, 92d Congr., 1st Sess., 25 Feb. 1971
Avail: Comm. on Interior and Insular Affairs

Congressional testimony concerning a study of the nation's energy resources and a review of the body of law and policy which influence the energy situation is presented. Examples of problems throughout the energy system which indicate the need for such an investigation are presented. Statements of law makers from various states are included to define the scope of the problem. P.N.F.

N71-35186# Civil Aeronautics Board, Washington, D.C.
CIVIL AERONAUTICS BOARD REPORTS TO CONGRESS, FISCAL YEAR 1970
Secor D. Browne GPO 1970 137 p refs
Avail: SOD $0.70

Civil Aeronautics Board regulatory action touched virtually every area of the agency's interest in fiscal 1970. The public convenience and necessity is best served by an economically sound industry and the air transport industry, while basically sound, has been assailed of late by a number of problems, including spiraling labor costs, disparity between capacity and demand, demands on capital resources, the high cost of money, inadequacies of the air traffic system, problems of environment and crimes against aircraft. The CAB took on rate and route problems as they evolved in fiscal 1970 and also took several major actions that can be expected to help guide the air transport industry soundly into the '70s. In January 1970, the CAB launched the Domestic Passenger Fare Investigation (DPFI), the first such broad, searching look at passenger fares in more than a decade. Author

N71-35188# RAND Corp., Santa Monica, Calif.
ILS: PREREQUISITE TO IMPROVED OPERATIONAL CAPABILITY
R. M. Paulson and R. B. Waina Mar. 1970 33 p Presented at the Management of Integrated Logistic Support Meetings, Mar. 1970; Sponsored by George Washington Univ. and the Washington Chapter of the Soc. of Logistics Engr.
(P-4318) Avail: NTIS

The development and characteristics of an Integrated Logistic Support system (ILS) are discussed. ILS is a composite of the elements necessary to assure the effective and economical support of a system or equipment at all levels of maintenance for its programmed life cycle. Factors which determine the effectiveness of ILS are: (1) operational capability, (2) availability, (3) dependability, and (4) performance. Author

N71-35189# National Science Foundation, Washington, D.C.
RESEARCH AND DEVELOPMENT IN INDUSTRY, 1969. FUNDS, 1969, SCIENTISTS AND ENGINEERS
Jan. 1970 89 p
(NSF-71-18) Avail: SOD $1.00

The National Science Foundation both conducts and sponsors surveys in the various sectors of the economy to better understand changes in R&D emphasis, as well as to measure the growth, magnitude, and other characteristics of research and development. The data obtained from these surveys are published by the Foundation and are designed to provide information useful to Government officials, legislators, and other individuals concerned with evaluating the role of research and development in furthering the national welfare and in the allocation of scientific resources. The results of the 1969 survey of industrial research and development are presented. Author

N71-35190# Committee on Science and Astronautics (U. S. House).
PANEL ON SCIENCE AND TECHNOLOGY, TWELFTH MEETING: INTERNATIONAL SCIENCE POLICY
Washington GPO 1971 381 p Proc. before the Comm. on Sci. and Astronautics, 92d Congr., 1st Sess., 26-28 Jan. 1971
Avail: US Capitol, House Document Room

The proceedings of the Panel on Science and Technology before the Committee on Science and Astronautics of the U. S. House of Representatives are presented. The theme of the proceedings was expressed as international science policy, viewed as a summation of national policies, international agreements, and voluntary associations between groups of scientists and engineers, plays an increasingly important role in a technological society. The sessions explore the nature of present policies, how the policies can be improved, and ways to more effectively harness the policies for meeting world wide problems. Author

N71-35194 Commerce Dept., Washington, D.C.
AIRLINE SERVICE IN THE USA
1971 80 p
Avail: NTIS

A travel agent's guide to air travel in the U.S.A. is presented. Topics discussed include: airlines and route maps, helicopter services, fares, and terminal facilities. F.O.S.

N71-35384*# McDonnell-Douglas Co., St. Louis, Mo. Advanced Engineering.
HYPERSONIC RESEARCH FACILITIES STUDY. VOLUME 1: Summary
2 Oct. 1970 87 p
(Contract NAS2-5458)
(NASA-CR-114322; MDC-A0013-Vol-1) Avail: NTIS CSCL 14B

The research and development requirements for hypersonic aircraft were assessed to provide NASA with descriptions of desirable hypersonic research facilities, and estimates of performance, costs, development schedules, and capabilities. It is concluded that a sound engineering, cost, and planning basis was established for the acquisition of new hypersonic research facilities when the need is appropriate. F.O.S.

N71-35391# West Valley Planning Agency, Calif.
ONTARIO INTERNATIONAL AIRPORT IMPACT STUDY, WEST VALLEY, CALIFORNIA
1971 61 p refs Sponsored by Dept. of Housing and Urban Develop.
(PB-199695) Avail: NTIS CSCL 13B

The plans for an international airport to be constructed at Ontario, California are discussed. Subjects involved in site selection and development are described. Employment and population growth trends for the area and the impact on the future of the airport are considered. P.N.F.

N71-35414# Development Sciences, Inc., East Sandwich, Mass.
A TECHNIQUE FOR THE SYSTEMATIC IDENTIFICATION OF POLLUTION REDUCTION MEASURES, EMIS Final Report
10 Nov. 1970 95 p refs
(PB-199332; APTD-0616) Avail: NTIS CSCL 13B

The alternatives available to government and to private industry as they cope with the conflict of economic growth and pollution abatement are discussed in relating the multifaceted approaches to the problem, the report has two purposes:(1) to minimize the conflict between economic growth and pollution abatement by examining opportunities which are often overlooked and to create an information system which clearly identifies the empirical possibilities available within the pollution abatement strategies considered. This approach, which is called Ecosystem of Machines Information System (EMIS), suggests a way of determining the minimum data needed by integrating data sets with abatement strategy: a way to maximize useful information by collecting data in the context of its use, and a systematic way to judge alternative approaches for particular industries in a decentralized economy. Author

N71-35714# Harvard Univ., Cambridge, Mass.
DECISION AND INSTITUTIONAL ASPECTS OF WEATHER MODIFICATION
In Bur. of Reclamation Proj. Skywater Feb. 1971 p 201-225 refs Supported by Dept. of Interior
Avail: NTIS HC $6.00/MF $0.95

Legal aspects of weather modification and its associated economic consequences are studied to develop private law doctrines. Federal control of modification activities are discussed along with proof of causation and assessment of damages. A federally administered insurance fund for compensating damages associated with weather modification activities is also discussed. It is concluded that there is strong support for the need of federal legislation. F.O.S.

N71-36200*# National Aeronautics and Space Administration. John F. Kennedy Space Center, Cocoa Beach, Fla.
USING THE COMPUTER AS AN AID IN PLANNING OPERATIONAL ANALYSIS BY SIMULATION

Raul D. Smith *In its* Space Shuttle Technol. Conf., Vol. 1 3 May 1971 p 157-173
Avail: NTIS CSCL 22C

Investigations into the use of computers as aids in planning reveal that without graphic communications, where a picture is worth a thousand words, and a means of relating pictures to real life, and changing the pictures rapidly and economically to reflect real life, computers will have little real use in managerial planning and actual operations. With this capability, operational and planning personnel will have one of the most powerful tools they could possess. It allows a fast economical analysis of present problems, potential problems, and the avoidance of problems which need not be planned. It is emphasized, however, that: (1) a computer is no substitute for human reasoning and decision making. (2) a human is no substitute for computer caclulations and repetitive operations. (3) use of a computer in planning requires caution since it can help define probabilities but not interpret them. Author

N71-36372*# Massachusetts Inst. of Tech., Cambridge. Alfred P. Sloan School of Management.
EXECUTIVE DECISION MAKING IN ORGANIZATIONS: IDENTIFYING THE KEY MEN AND MANAGING THE PROCESS
George F. Farris Jun. 1971 55 p refs *Its* Working Paper No. 551-71
(Grant NGR-23-005-395)
(NASA-CR-121886) Avail: NTIS CSCL 05A

A model of executive decision making is developed which examines a series of decisions made over time and emphasizes the interaction of members of an organization in making these decisions. A review of the literature suggests that members of an organization can facilitate the decision making of their colleagues by performing any one of four colleague roles: thinking facilitator, power equalizer, technical link-pin, and organizational link-pin. The concept of role net is advanced to characterize the informal organization involved in decision making. Two studies are described which illustrate the use of the colleague role approach to executive decision making. In one, some characteristics of the key men in executive decision making are identified, and in the other the performance of colleague roles is related to career development. Several suggestions are made for refinement and extension of colleague role theory. Author

N71-36373*# Massachusetts Inst. of Tech., Cambridge. Alfred P. Sloan School of Management.
COLLEAGUE ROLES AND INNOVATION IN SCIENTIFIC TEAMS
George F. Farris Jul. 1971 25 p refs *Its* Working Paper No. 552-71
(Grant NGR-23-005-395)
(NASA-CR-121885) Avail: NTIS CSCL 05B

The innovation of teams of scientists was related to their colleague role nets, utilizing an executive decision making model. Team innovation tended to be associated with greater performance of technical roles within the team, and the supervisor's being more oriented toward his team and less to outsiders. During the idea suggestion stage, the roles most associated with team innovation were the supervisor's receiving original ideas from more outside sources but having fewer original ideas himself, group members providing each other with technical information, and the availability of organizational information from fewer sources inside or outside the group. During the proposal development stage, high innovation teams tended to be characterized by greater exchange of help among themselves in thinking through technical problems and greater usefulness of their supervisors in critically evaluating their ideas. Author

N71-36377# RAND Corp., Santa Monica, Calif.
AN EXTENDED CONCEPT OF MODEL
E. S. Quade Jul. 1970 13 p refs
(P-4427) Avail: NTIS

Arguments are presented refuting the cruciality of mathematical formulation of models for operations research applications where factors are obscure and difficult to define. A reliance on expert judgment and intuition is stressed as being significant for this situation. Operational gaming is cited as an example of an accepted operations research technique which does not rely on mathematical formulation. The Delphi procedure is discussed in detail as an example of an expansion of the model concept to include any device that provides a logical means to predict and compare the outcome of alternative actions, regardless of its representative features or how efficient it is at optimization. J.G.M.

N71-36380# Bureau of Labor Statistics, Washington, D.C.
AIRLINE EXPERIENCE UNDER THE RAILWAY LABOR ACT
1971 55 p refs *Its* Bull. No. 1683
Avail: SOD $0.55

A descriptive and statistical account of the industrial relations, mediation, work stoppage, and emergency dispute experience of the airlines under the Railway Labor Act is provided. Published and unpublished records were utilized to conduct a more comprehensive analysis than had been available. Author

N71-36385# Committee on Science and Astronautics (U. S. House).
SCIENCE, TECHNOLOGY, AND THE ECONOMY
Washington GPO 1971 164 p refs Hearings before Comm. on Sci. and Astronaut., 92d Congr., 1st Sess., No. 7, 27-29 Jul. 1971
Avail: Subcomm. on Sci., Res., and Develop.

The hearings were held to explore the effects of science and technology on the economy of the U.S. and the rest of the world. The Committee was particularly interested in determining the total resources that should be invested in research and development, and the optimum ways for making these investments. The complete text of these proceedings is presented. J.G.M.

N71-36586# Carnegie-Mellon Univ., Pittsburgh, Pa. Management Sciences Research Group.
DETERMINING OPTIMAL GROWTH PATHS IN LOGISTICS OPERATIONS
V. Srinivasan and G. L. Thompson Apr. 1971 41 p refs
(Contract N00014-67-A-0314-0007)
(AD-726509; RR-240) Avail: NTIS CSCL 12/2

The paper considers a logistics system modeled as a transportation problem with a linear cost structure and lower bounds on supply from each origin and to each destination. An algorithm is provided for obtaining the growth path of such a system, i.e., determining the optimum shipment patterns and supply levels from origins and to destinations, when the total volume handled in the system is increased. Extensions of the procedure for the case when the costs of supplying are convex and piecewise linear and for solving transportation problems that are not in standard form are discussed. A procedure is provided for determining optimal plant capacities when the market requirements have prespecified growth rates. A goal programming growth model where the minimum requirements are treated as goals rather than as absolute requirements is also formulated. Author

N71-36776# Advisory Group for Aerospace Research and Development, Paris (France).
RELIABILITY OF AVIONICS SYSTEMS
Jul. 1971 191 p refs Mostly in ENGLISH; partly in FRENCH Conf. held in Rome, 16-17 Sep. 1971 and London, 20-21 Sep. 1971; Sponsored by Avionics Panel and Exchange Programme of AGARD *Its* Lecture Series No. 47
(AGARD-LS-47-71) Avail: NTIS

CONTENTS:

1. RELIABILITY AND SURVIVABILITY E. Keonjian (Grumman Aerospace Corp.)

2. TECHNIQUES OF SYSTEM RELIABILITY ESTIMATION, INCLUDING FAILURE EFFECT ANALYSIS (FAILURE CONSEQUENCE) W. T. Sumerlin (McDonnell Aircraft Co., St. Louis, Mo.) 29 p refs

3. CORRELATION BETWEEN ESTIMATION TESTS AND SYSTEM OPERATING DATA M. M. Tall (RCA, Morrestown, N.J.) 9 p refs

4. EFFECTIVENESS OF RELIABILITY PROGRAM ELEMENTS W. T. Sumerlin (McDonnell Aircraft, St. Louis, Mo.) 9 p

5. COST EFFECTIVENESS OF BUILT-IN TEST PROVISIONS M. M. Tall (RCA, Moorestown, N. J.) 8 p refs

6. HIGH RELIABILITY DESIGN TECHNIQUES APPLIED TO THE LUNAR MODULE J. J. Bussolini (Grumman Aerospace Corp.) 34 p refs

7. TESTING THE RELIABILITY OF AVIONIC EQUIPMENT FOR SPACECRAFT APPLICATIONS G. Vollhardt (Seimens AG) 10 p

8. METHODS OF SPECIFYING AND CONTROLLING DESIGN RELIABILITY J. J. Bussolini (Grumman Aerospace Corp.) 19 p refs

9. RELATIONSHIPS BETWEEN PROGRAM TEST AND USER SUPPORT COSTS M. M. Tall (RCA, Moorestown, N. J.) 9 p refs

9. RELATIONSHIPS BETWEEN PROGRAM TEST AND USER SUPPORT COSTS M. M. Tall (RCA, Moorestown, N. J.) 9 p refs

10. SYSTEM OPERATIONAL CONSIDERATIONS AND THEIR RELATIONSHIP TO THE TEST PROCESS W. T. Sumerlin (McDonnell Aircraft, St. Louis, Mo.) 8 p refs

11. TECHNIQUES OF ANALYZING ACCELERATION P. Blanquart (Centre Natl. d'Etudes des Telecommunication, Lannion, France) 8 p

12. THE BENEFITS OF A TOTALLY INTEGRATED RELIABILITY TEST PROGRAM J. J. Bussolini (Grumman Aerospace Corp.) 21 p refs

13. OPERATIONAL CONSIDERATIONS AND SYSTEMS RELIABILITY B. E. Baker (Royal Air Force, High Wycombe, England) 7 p

N71-36780# Radio Corp. of America, Moorestown, N.J.
COST EFFECTIVENESS OF BUILT-IN TEST PROVISIONS c15
M. M. Tall *In* AGARD Reliability of Avionics Systems Jul. 1971 8 p refs
Avail: NTIS

The feasibility of using built in test provisions (BIT) as a means of improving operational effectiveness of aircraft is discussed. The primary purpose of BIT is to indicate to the user if the prime equipment is operating satisfactorily. It provides information upon which a decision to abort, modify, or continue a mission may be based. Bit may also be applied to passive devices. In highly complex equipment BIT may indicate degrade performance of portions of the equipment as well as catastrophic failure, and indicate the use of any alternate mode of operations. The cost effectiveness of BIT is also discussed. E.H.W.

N71-36783# Grumman Aerospace Corp., Bethpage, N.Y. Engineering Operations and Administration.
METHODS OF SPECIFYING AND CONTROLLING DESIGN RELIABILITY c15
J. J. Bussolini *In* AGARD Reliability of Avionics Systems Jul. 1971 19 p refs
Avail: NTIS

Some examples of techniques used to accomplish early determination of system and equipment reliability requirements, the methods use to specify these requirements and the contractual techniques used to test and demonstrate compliance to specification requirements are examined. Incentive--penalty contracting for reliability is discussed including recommendations for relating these incentives and penalties to conventional and modified demonstration test techniques. Author

N71-36788# Royal Air Force, High Wycombe (England). Strike Command.
OPERATIONAL CONSIDERATIONS AND SYSTEMS RELIABILITY c15
B. E. Baker *In* AGARD Reliability of Avionics Systems Jul. 1971 7 p
Avail: NTIS

The problem of deciding what reliability to specify and how to ensure that this reliability is achieved is discussed. An example is given of trade-offs between reliability and maintainability and performance parameters. The need for a formal reliability program is stressed and parts of this are discussed in detail. The value of reliability testing at the end of development is illustrated by a costed example. Author

N71-37580*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
JOINT ASSESSMENT AND MANAGEMENT EVALUATION SYSTEM
Preston T. Farish and Richard J. Stein 1 Jul. 1971 41 p
(NASA-TM-X-64537) Avail: NTIS CSCL 05A

An optimized task arrangement to integrate development functions into an organizational structure is presented in this report. Author

N71-37587# Electronic Systems Div., Bedford, Mass.
PERSONNEL SUBSYSTEM MANAGEMENT OF ELECTRONIC SYSTEMS
William H. Hendrix May 1971 70 p refs
(AD-726552; ESD-TR-71-168) Avail: NTIS CSCL 05/9

Personnel subsystem management within the Electronic Systems Divison is presented. Presentation includes a description of the functional areas of the personnel subsystem, and those events which lead to an effective personnel subsystem within the system acquisition process. The personnel subsystem requirements for each phase of the system acquisition life cycle are presented as an integral part of the system management process. Author

N71-37589# Defense Dept., Washington, D.C.
LIFE CYCLE COSTING PROCUREMENT GUIDE Interim Report
Jul. 1970 119 p
(AD-726978; LCC-1) Avail: NTIS; SOD $1.50 CSCL 05/1

Life Cycle Costing (LCC) is an acquisition or procurement technique which considers operating, maintenance, and other costs of ownership as well as acquisition price, in the award of contracts for hardware and related support. The objective of this technique is to insure that the hardware procured will result in the lowest overall ownership cost to the government during the life of the hardware. This interim guide is limited to the necessary guidelines for implementing LCC in the procurement of less than a complete weapon system in a competitive environment where the minimization of life cycle cost is the primary economic objective. Author

N71-37692# RAND Corp., Santa Monica, Calif.
NEW DEVELOPMENTS IN TRANSPORATION ANALYSIS: EVALUATION OF MIXES OF MODES IN ALTERNATIVE REGIONAL ENVIRONMENTS
Frederick S. Pardee Jul. 1970 29 p refs
(P-4425) Avail: NTIS

The application of recent methodological research to the analysis of transportation problems was investigated to measure incremental benefits to be derived from providing transportation services to a region. The geographical region chosen to illustrate the application of the methodology is the area from Washington, D.C. to New York City, and incorporates counties extending west to the Apalachian Mountains. Methods to estimate user, operator, and societal impacts when the total system mix operates within a complex network of future regional environments are included. F.O.S.

N71-37656 National Lending Library for Science and Technology, Boston Spa (England).
THE PROBLEM OF CREATIVENESS OF RESEARCH-WORKERS
R. Robin Dec. 1970 24 p Transl. into ENGLISH from Kodak-Pathe Bur. of Res. into Appl. Human Sci. Publ., Dec. 1970 15 p
(NLL-Trans-746-801-(9022.401)) Avail: Natl. Lending Library, Boston Spa, Engl.: 2 NLL photocopy coupons

A psychotechnical analysis of the creativeness of research personnel, based on personal interviews, is presented. Tasks, working conditions, and personal qualities are discussed as well as the organizational structure, interpersonal relationships, motivations, and the possibility of failure. The dynamics of the research worker including his reactions to situations, materials, temptation, and risk and his aggressiveness and self-image are also considered. J.M.

N71-37742# Information Processing Association of Israel, Jerusalem.
PROCEEDINGS OF THE NATIONAL CONFERENCE ON DATA PROCESSING
Asa Kasher, ed. (Bar-Ilan Univ.) 1970 478 p refs Partly in ENGLISH; partly in HEBREW Conf. held in Tel-Aviv, 12 Oct. 1970
Avail: NTIS HC $6.00/MF $0.95

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1. TECHNOLOGICAL FORECAST 1970 I. L. Auerbach (Auerbach Corp.) p E1-E18

2. MADAP: A COMPUTERIZED AIR-TRAFFIC CONTROL SYSTEM L. Borocin (Eurosystems) p E19-E33

3. THE IMPACT OF AUTOMATION UPON HEALTH DELIVERY SYSTEMS IN THE 1970's N. M. Trowe (Med. and Applied Res. System, Inc.) p E35-E45

4. A GENERAL APPROACH TO HEURISTIC RESOURCE ANALYSIS R. Karny (Inform. Process. Assoc. of Israel) p E47-E60 refs

5. APL: BASIC CHARACTERISTICS AND APPLICATIONS TO MATHEMATICAL PROGRAMMING AND TO DATA PROCESSING E. Sharon (Hebrew Univ.) p E61-E90 refs

6. A "COMPUTER-SYSTEM LANGUAGE" (CSL): A LANGUAGE FOR JOB CONTROL N. Minsky and I. Rotbard (Hebrew Univ.) p E91-E99 ref

7. MANAGEMENT INFORMATION SYSTEMS N. S. Prywes (Penna. Univ.) p E101-E109 refs

8. AUTOMATIC READING OF HANDWRITTEN HEBREW A. J. van der Toorn (Neth. Postal and Telecommunications Service) p E111-E126 refs

N71-37749# Pennsylvania Univ., Philadelphia. Moore School of Electrical Engineering
MANAGEMENT INFORMATION SYSTEMS
Noah S. Prywes *In* Inform. Process. Assoc. of Israel Proc. of the Natl. Conf. on Data Process. 1970 p E101-E109 refs

(N00014-67-A-0216-0007)
Avail: NTIS HC $6.00/MF $0.95

MIS is a generic concept. It applies to the acquisition, organization and processing of information in the conduct of business, industrial or government activities. Its core has traditionally been in accounting and control activities. Existing MIS are primarily batch oriented with the files organized sequentially, specially arranged for each processing run. In advanced MIS the data bases will be integrated to contain all the information, with minimum redundance, and transactions will be processed through accessing the data on a random access basis. Author

N71-37755# Joint Publications Research Service, Washington, D.C.
COMPUTER ANALYSIS AND MATHEMATICAL MODELING
1 Oct. 1971 25 p refs Transl. into ENGLISH from Ekon. i Mat. Metody (Moscow), v. 5, no. 1, 1969 p 63-72 and 153-157
(JPRS-54168) Avail: NTIS

CONTENTS:

1. COMPUTER ANALYSIS OF BUSINESS GAMES V. V. Kolbin et al p 1-15 refs

2. MATHEMATICAL MODELS OF PLANNING AND CONTROL OF SCIENTIFIC RESEARCH F. G. Gurvich p 16-24 refs

N71-37756# Joint Publications Research Service, Washington, D.C.
COMPUTER ANALYSIS OF BUSINESS GAMES
V. V. Kolbin et al *In its* Computer Analysis and Mathematical Modeling 1 Oct. 1971 p 1-15 refs
Avail: NTIS

A complex computerized game for training a group of business students in decision making and cooperation is described. The students are accustomed to analyzing available information, holding conferences, organizational experience, and decision making under conditions of risk and indeterminancy. The game complex is represented by the extracting industry, the processing industry, and the industry producing national consumer goods, plus a bank and a board of arbitrators. Each industry is subdivided into three specialties, and four games with different conditions are described. Instructions for the participants and the sequence of operations are outlined, and the problem of stochastic linear programming is discussed. N.E.N.

N71-37757# Joint Publications Research Service, Washington, D.C.
MATHEMATICAL MODELS OF PLANNING AND CONTROL OF SCIENTIFIC RESEARCH c19
F. G. Gurvich *In its* Computer Analysis and Mathematical Modeling 1 Oct. 1971 p 16-24 refs
Avail: NTIS

Dynamic mathematical models of integral linear programing are discussed for the optimal development of applied scientific research. The problem considers individual research organizations and individual branches of research. Each organization can work in one or several fields of research, and each division of scientific research is characterized by definite expenditures of limited

resources, expenditures of ideas or procedures, and production of a defined new idea or set of ideas, procedures, technology, and materials. A defined technical or social result such as improved labor or safety conditions is included, along with estimates of effectiveness of each of several possible versions. N.E.N.

N71-37822# Office of Naval Research, London (England).
A DAY AT THE BROWN BOVERI RESEARCH CENTER
Edward I. Salkovitz 16 Jun. 1971 12 p
(AD-727597; ONRL-R-16-71) Avail: NTIS CSCL 14/2

The Brown Boveri Center is in a sense the corporate laboratory of the parent multinational company. The report briefly describes the laboratory's function within the organization, its management and the three main areas of research. The latter center around solid state physics, physics of fluids, and automatic control and instrumentation. Directional solidification of the cobalt chromium carbide system, as well as physical properties of certain carbides and carbon fibers are discussed. There then follows an example of a problem in 'reduction to practice', namely, the need to maintain integrity in sizable p-n silicon junctions. A description is also given of some of the work in the field of coherent optics as well as technological interests in plasma physics. Finally, mention is made of the more recent venture at the laboratory into automatic control. Author (GRA)

N71-38260# Argonne National Lab., Ill.
SODIUM TECHNOLOGY Quarterly Report, Oct. - Dec. 1970
G. M. Kesser, Comp. Mar. 1971 63 p refs
(Contract W-31-109-eng-38)
(ANL/ST-8) Avail: NTIS

Work in the national meter program was continued on instrumentation for on-line monitoring of oxygen, carbon, and hydrogen impurities in sodium. Methods of detecting leaks in steam generators were studied to establish a commercial capability for on-line meters. The management effort involved formulation of interim standard analytical and sampling methods and the establishment of sample interchange programs to test these methods. Work continued on the development of a method for detecting fuel-cladding failures by monitoring the Xe-135m daughter of I-135. Studies of the chemistry of sodium included investigation of the nature of nitrogen-bearing species and elucidation of phase relations in the sodium-rich corner of the Na-O-H ternary system. Work on the purification of sodium continued with construction of an apparatus for characterizing the impurity content of cold-trapped sodium. Studies of materials-coolant compatibility included investigation of the transport of carbon in sodium-steel systems and development of methods for determining activities of nonmetallic impurities in sodium by equilibration of metal specimens. Author (NSA)

N71-38684*# McDonnell-Douglas Astronautics Co., St. Louis, Mo.
SIMULATIONS TO SUPPORT SYSTEMS ENGINEERING/ INTEGRATION Final Report
W. W. Schramm and C. L. Hoyt 15 Sep. 1971 352 p
(Contract NAS8-26920)
(NASA-CR-120094; MDC-E0448) Avail: NTIS HC $6.00/MF $0.95 CSCL 22B

Simulations required to support systems engineering and integration efforts related to the Space Shuttle development program are defined. The study identified 62 Booster vehicle and 69 Orbiter vehicle analyses and studies requiring support of simulation tasks. A summary list of these analyses and studies is presented. Simulation Requirements Descriptions (SRD's) were prepared for each Booster and Orbiter simulation task. These SRD's documented in detail the following (1) the objective of each simulation task, (2) the justification for using simulation techniques, (3) the description of the simulation task, (4) the generic facility requirements, and (5) the schedule showing relation to program milestones. Eleven Booster simulation facilities and sixteen Orbiter simulation facilities were identified as generic facility types required to perform the simulations. A list summarizing facility requirements is presented. Author

N71-38777*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala. Program Planning Office.
INTEGRATED MULTIPATH PROGRAM ANALYSIS AND COST TECHNIQUE (IMPACT)
O'Keefe Sullivan 15 Sep. 1971 39 p
(NASA-TM-X-64620) Avail: NTIS CSCL 05A

A technique developed to assess the impact of multiple program decisions on program cost is described and illustrated. The information presented includes a discussion of the problem of determining the effect of decisions on program cost and describes the approach to the problem solution employed by the technique described. For illustration, an application of the technique to a sample problem is included. The application includes a discussion of the sample problem, a computer program for problem solution, and the output of the program which reflects the cost of alternate solutions to the problem. A discussion of further applications and planned activities for utilization of the technique is also included. Author

N71-38780*# George Washington Univ., Washington, D.C.
ON THE COST OF ENGINEERING EDUCATION
Guy Black Nov. 1970 159 p refs *Its* Monograph No. 7
(Grant NGL-09-010-030)
(NASA-CR-123114) Avail: NTIS CSCL 05I

The faculty necessary for an accredited engineering curriculum as a function of the number of students, faculty workload, and curriculum characteristics was determined. A minimum faculty of 32 is required, and as the student body is increased from 200 to 3200, the required faculty increases 3 3/4 times; hence there are considerable economics of scale in engineering education. The study shows how number of faculty is affected by modification of the curriculum, number of areas in which students can major, number of courses, class size or faculty workload. Faculty requirements in small autonomous engineering colleges are shown to be excessive, and with small enrollments the advantage of being part of a general university is substantial. Where engineering enrollment is large, it is possible to maintain breadth of curricula, faculty workload well within AAUP standards and moderate class size although student-faculty ratio exceeds 25:1. The research method of synthesizing a faculty from basic requirements avoids undefined variations in program characteristics that would influence survey data. The method is flexible and generally applicable to university financial and manpower planning. Author

N71-38781*# George Washington Univ., Washington, D.C.
THE CONTEXTUAL APPROACH TO TECHNOLOGY ASSESSMENT. IMPLICATIONS FOR ONE FACTOR FIX SOLUTIONS TO COMPLEX SOCIAL PROBLEMS
Louis H. Mayo Apr. 1971 92 p refs
(Grant NGL-09-010-030)
(NASA-CR-123115; GWPS-Mon-9) Avail: NTIS CSCL 05K

The one-factor fix notion (legal, economic, or technological) is examined as a means of solving existing social problems or achieving major social goals in modern, complex society. It is to demonstrate that technology assessment can assist in identifying the mix of means through time phases which will lead to more satisfactory alternative distributions of social benefits and social costs associated with public programs and projects having major

technological components. It is pointed out that even where one primary means (for example, a technological application) is advanced as an adequate mode of dealing with a social problem, the contextual (total social impact) approach to assessment of such means will disclose the various non-technological facilitating arrangements required to effectively implement such means. It will also provide an evaluation of the desirability or undesirability of the effects which will flow from the implementation of such means through the supportive arrangements deemed most advisable for the particular application. Author

N71-38784# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
SCIENTIFIC AND TECHNOLOGICAL FORECASTING
G. M. Dobrov 21 May 1971 241 p refs Transl. into ENGLISH of the mono. "Prognozirovanie Nauki i Tekhniki" Moscow, 1969 p 1-208
(AD-727232; FTD-MT-24-358-70) Avail: NTIS CSCL 14/2

The book is concerned with one of the most urgent problems of scientifically based planning and control of the development of science and technology - contemporary methods of analyzing and forecasting trends in scientific and technological progress. The materials for this book are the most recent developments of Soviet and foreign students of science and also on the research carried out by the scientific collective headed by the author. The book presents the original theoretical conception of scientific and technological forecasting and outlines forecasting methods of interest both for practical planning works in the field of scientific and technological development, and for the projection of complex scientific and technological objects required in advanced scientific information. Similarly, the work is one of the first books in the USSR which systematically outlines and analyzes the contemporary state of scientific and technical forecasting as a complex problem in the study of science.
Author (GRA)

N71-38788# Department of Transportation, Washington, D.C. Office of Policy Review.
FREIGHT LOSS AND DAMAGE: AN EXPLORATORY STUDY OF ECONOMIC, ADMINISTRATIVE, AND LEGAL FACTORS AFFECTING FREIGHT LOSS AND DAMAGE
Feb. 1971 67 p refs
Avail: NTIS

Available statutes and practices were reviewed, interviews were held with leading carrier and shipper representatives, and available statistics were examined and evaluated. A special statistical analysis of one case made from original carrier reports to the ICC. The conclusions are the following: (1) Loss and damage have an apparent large but indeterminate economic significance. (2) Carriers must improve their methods of controlling and administering their affairs to prevent loss and damage. (3) Available legal remedies to the shipper and protections to the carrier are traditional: inconvenient if not cumbersome, a source of injustice to the smallshipper and tolerant of corruption by the large one. The reforms needed are better statistical and economic tools to measure the true cost, improved administrative performance of the carrier business, and innovation in the way claims are settled and responsibility is assigned. Author

N71-38791# Royal Aircraft Establishment, Farnborough (England).
THE USE OF DATA-PROCESSING: FROM MANAGEMENT ASSISTANCE TO AN AID IN DECISION-MAKING [L'UTILISATION DE L'INFORMATIQUE: DE L'AIDE DE LA GESTION A L'AIDE A LA DECISION]
Renaud de Rochebrune Apr. 1971 18 p Transl. into ENGLISH from Les Dossiers de l'Entreprise (France), no. 22, 1970
(RAE-Lib-Trans-1581) Avail: NTIS

The use of the computer in daily management is discussed and its potential as an aid to decision making is described. Explanations of the differences between the computer in data processing and its use in the field of management are presented. Reasons for under employment of computers as management aids are proposed. Author

N71-38798# Federal Aviation Administration, Washington, D.C.
A POLICY PAPER GUIDELINES FOR NATIONAL AVIATION SYSTEM PLANNING AND R AND D POLICY Final Report
Benjamin F. L. Darden, Thomas P. Messier, and Milton B. Meisner Jun. 1971 109 p refs
(FAA-AV-71-2; FAA-AV-100) Avail: NTIS

In most long range aviation system planning, a singleness of purpose is missing. The proposed Goals Approach method of aviation system planning gives clear direction for system development. Aviation system goals should relate to broad societal needs as well as internal system requirements. Levels of research and development strongly affect rate of goal achievement. Industry and government program information indicates FAA research expenditures are appropriate at an annual expenditure rate of $100-200 million. Author

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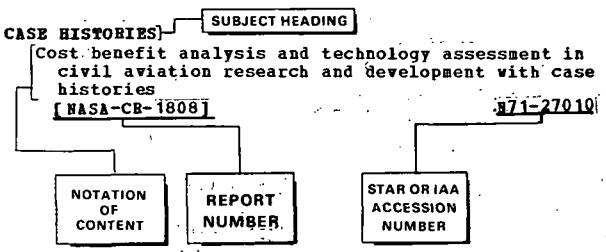

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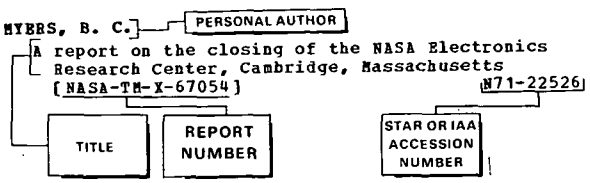

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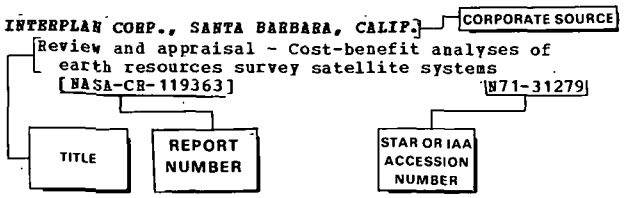

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—NATIONAL AERONAUTICS AND SPACE ACT OF 1958

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